

# NCHSR

RESEARCH MANAGEMENT  
SERIES

**Emergency  
Medical Services  
Systems  
Research Projects,  
October 1979-  
March 1981**



RA  
645  
.5  
E495  
1981

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Public Health Service  
Office of Health Research, Statistics, and Technology  
National Center for Health Services Research

## NATIONAL CENTER FOR HEALTH SERVICES RESEARCH

### RESEARCH MANAGEMENT SERIES

The Research Management Series describes programmatic rather than technical aspects of the NCHSR research effort. Information is presented on the NCHSR goals, research objectives, and priorities; in addition, this series contains administrative information on funding, lists of grants and contracts, and special programs. Publications in this series are intended to bring basic information on the NCHSR and its programs to research planners, administrators, and others who are involved with the allocation of research resources.

### ABSTRACT

Summaries of research projects supported by the National Center for Health Services Research (NCHSR) from October 1, 1979 - March 31, 1981, under authority of Section 1205 of the Emergency Medical Services Systems Act. Also included are lists of: (1) EMS-related research projects supported under authority of Section 305 of the Public Health Service Act; and (2) publications resulting from EMS research supported by NCHSR.

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June 1981



## FOREWORD

Section 1205 of the Emergency Medical Services (EMS) Systems Act of 1973 (Public Law 93-154) and Amendments in 1976 and 1979 authorize a program of research in "emergency techniques, methods, devices, and delivery." The 1976 Amendments require that reports of studies supported under this authority contain "recommendations and a plan of action for applying the results of the research...to improve the delivery of emergency medical services." The National Center for Health Services Research (NCHSR), located in the Office of Health Research, Statistics, and Technology, is the DHHS organization responsible for administering this applied research effort.

Projects which are directly concerned with improvements in EMS Systems are listed alphabetically by Principal Investigator in the section "EMS RESEARCH PROJECTS," each of these abstracts is identified as "AUTHORITY: 1205." NCHSR also supports, under authority of Section 305 of the Public Health Service Act, a number of other projects which address important health services research questions in emergency medical services settings. Because readers interested in emergency care are likely to be concerned about these other issues as well, abstracts of these related studies are included in this document. They are listed alphabetically in the section "EMS-RELATED RESEARCH PROJECTS," and each is identified as "AUTHORITY: 305." All abstracts describe projects active during the period October 1, 1979-March 31, 1981.

Additional information as to methods, progress or findings, of any project may be obtained from the Principal Investigator at the address or telephone number provided in each abstract, or from:

National Center for Health Services Research  
Division of Extramural Research  
Attn: EMS, Room 8-27  
3700 East-West Highway  
Hyattsville, Maryland 20782  
(301) 436-8936

Gerald Rosenthal, Ph.D.  
Director



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ACTIVE EMS RESEARCH PROJECTS: 1205

OCTOBER 1979 - MARCH 31, 1981



TITLE: Health Status of Survivors from  
Cardiac Arrest

GRANT NUMBER:  
5 R01 HS 03058

GRANTEE INSTITUTION: King County Health  
Department

PROJECT PERIOD:  
09/30/78-03/31/81

PRINCIPAL INVESTIGATOR:  
Lawrence Bergner, M.D.  
King County Health Department  
Project Restart  
508 Smith Tower  
Seattle, Washington 98104  
(206) 344-3410

AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 78 \$ 99,650  
FY 79 \$ 98,337  
FY 80 \$ 61,800

#### OBJECTIVE:

To determine the health status--physical and psychosocial--of survivors of out-of-hospital cardiac arrest using the Sickness Impact Profile (SIP) and other measures of dysfunction.

#### SCOPE:

Survivors of cardiac arrest in Seattle and King County are interviewed six months after discharge to determine their health status. Their SIP scores are compared with those of a group of normal patients and with a group of myocardial infarction patients who did not suffer an arrest. Comparisons within groups are also made to identify factors in treatment which may affect health status.

#### FINDINGS:

Pilot work suggested differences in health status following cardiac arrest depending upon whether prehospital care is given by basic technicians or by paramedics, whether resuscitation is begun immediately or is delayed, and the duration of cardiopulmonary resuscitation prior to the provision of definitive care. Preliminary findings from the current study suggest that cardiac arrest patients who survive for six months after discharge recover to reasonably high levels of health, though not as high as myocardial infarction patients who did not suffer an arrest. Further analysis will address the effect of type of treatment and time factors. The information will contribute to understanding the long-term cost-effectiveness of sophisticated prehospital cardiac care.

TITLE: Treating Cardiac Arrest with  
Defibrillation by EMTs

GRANT NUMBER:  
5 R18 HS 03215

GRANTEE INSTITUTION: King County Health  
Department

PROJECT PERIOD:  
04/01/78-10/31/80

PRINCIPAL INVESTIGATOR:  
Lawrence Bergner, M.D.  
King County Health Department  
Project Restart  
508 Smith Tower  
Seattle, Washington 98104  
(206) 344-3410

AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 78 \$ 93,554  
FY 79 \$ 78,586  
FY 80 \$ 53,836

#### OBJECTIVE:

To determine the effectiveness of prompt defibrillation, performed by Emergency Medical Technicians (EMTs), in improving survival rates for out-of-hospital cardiac arrest patients.

#### SCOPE:

This project takes advantage of a natural experiment in King County, Washington, where an Advanced Life Support system was introduced in phases. A comparison will be possible of the experience of areas served by Basic EMTs, by EMTs trained and certified in the use of defibrillators (EMT/DCs), and by paramedics (EMTs extensively trained in advanced cardiac techniques such as intubation and medications as well as defibrillation). A surveillance system has been established to identify all out-of-hospital cardiac arrest patients who receive emergency care and the outcome (death, hospital admission, long-term survival) is determined for each patient. The effectiveness of EMT/Defibrillation services is compared with the results of basic EMT service and with paramedic results. The study is also examining the tiered system in which EMT/DC's supplement paramedic services.

#### FINDINGS:

As compared with Basic EMT services, incorporation of EMT defibrillation produces survival rates similar to those achieved with paramedic services, about a four-fold increase. These results are encouraging and suggest that defibrillation by EMTs may be an alternative or a supplement to the much more costly paramedic program for improving prehospital cardiac care. This system design would particularly aid rural and remote EMS systems containing communities with low population densities and limited budgets.

PUBLICATION:

Eisenberg, M.S., M.K. Copass, A. P. Hallstrom, B. Blake, L. Bergner, F.A. Short and L.A. Cobb, "Treatment of Out-of-hospital Cardiac Arrests with Rapid Defibrillation by Emergency Medical Technicians." New England Journal of Medicine 302, 1380-1382 (June 19, 1980).



TITLE: Bias in Comparing Outcomes of  
Burn Units

GRANT NUMBER:  
5 RO3 HS 03785

GRANTEE INSTITUTION: Regents, University  
of California

PROJECT PERIOD:  
09/30/79-09/29/81

PRINCIPAL INVESTIGATOR:  
Charles C. Berry, Ph.D.  
Department of Community Medicine  
University of California, San Diego  
La Jolla, California 92093  
(714) 452-2098

AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 79 \$ 15,150  
FY 80 \$ 18,742

#### OBJECTIVE:

To assess the bias in estimates of severity which are used in comparing the effectiveness of treatments given in different burn units, and to develop less biased methods.

#### SCOPE:

A mathematical model is being constructed of the process through which the effectiveness of treatment in specialized burn care units is estimated. The model is designed to determine the amount of bias in the estimation of outcomes of burns of different severity levels. This allows for the development and testing of other, less biased procedures for comparing the care given in such units. One such procedure involves the development of mathematical models to correct for small errors in measuring the severity of burn injury, errors of considerable importance in studies which use complex analytic methods to analyze and compare the results of burn treatment in different hospitals.

#### FINDINGS:

This study will provide methods which will allow less biased estimates of effects of treatments given in different burn units where such units vary in average severity of cases treated. Previous mathematical adjustment procedures were biased against those units treating more severely burned patients. This may well account for the failure of other investigators to find a difference in efficacy between treatments in community hospitals and special burn care units. Methods growing out of these investigations can be expected to reduce the bias in many non-experimental evaluations of health services, thereby permitting more accurate assessments of the effectiveness of Federal activities such as regional EMS systems or Burn Centers.

PUBLICATION :

Berry, C.C., T. L. Wachtel, H.A. Frank and R. Sanders, "Comparing Burn Units: Statistical Bias Against Special Care Facilities." Presented at the American Burn Association Annual Meeting, San Antonio, Texas (March 1980).

TITLE: Clinical Algorithms for EMT  
Performance Assessment

GRANT NUMBER:  
5 R18 HS 02418

GRANTEE INSTITUTION: Trustees, University of  
Pennsylvania

PROJECT PERIOD:  
06/30/76-03/31/80

PRINCIPAL INVESTIGATOR:  
C. Gene Cayten, M.D.  
University of Pennsylvania  
Emergency Health Services  
3609 Locust Walk/C9 Room 302  
Philadelphia, Pennsylvania 19104  
(215) 243-6304

AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 76 \$249,088  
FY 77 \$227,857  
FY 78 \$123,730

#### OBJECTIVE:

To provide a mechanism for assessing and upgrading the performance of EMT-Ps ("paramedics" trained in Advanced Life Support techniques) by developing, implementing and testing clinical algorithms in the field. A clinical algorithm is a set of detailed instructions as to the sequence in which indicated treatment tasks are to be performed for a given type of patient.

#### SCOPE:

A set of cardiac algorithms was developed by consulting with a panel of local and national experts in EMS. The cardiac algorithms were designed into a pocket size booklet and field tested by the City of Philadelphia paramedics. A controlled test was carried out by half of the Fire Rescue platoons who used the booklet while the other half served as a control group, using their standard operating protocol. Baseline data included paramedic characteristics, an arrhythmia recognition and management test score, and data on survival following treatment of ventricular fibrillation in the field. After a seven month field trial, all paramedics were again tested to analyze the algorithm vs non-algorithm groups' pre- and post-test scores. In addition, the mortality rates were compared of patients treated by the groups.

#### FINDINGS:

Though the use of the algorithms was not mandatory, 80% of the experimental groups chose to use them. The algorithms seemed to be most useful as a review after managing a case and for refresher purposes, and seemed to improve performance on the written test. When surveyed, the paramedics responded favorably to the algorithm booklet. Preliminary analysis also shows significantly higher survival rates for patients with ventricular fibrillation treated by the algorithm group, when response times are adjusted. The algorithm has promise as an effective aid to training EMT's. It not only improves their knowledge and performance but improves the quality of prehospital coronary care.

PUBLICATIONS AND PRESENTATIONS:

Cayten, C.G., R. Staroscik, K. Walker and J. Morganroth, "The Impact of Prehospital Cardiac Algorithms on Ventricular Fibrillation Survival Rates." Presented at the UA/EM Convention (1980).

Cole, L., J. Sims, S. Otterbein, R. Staroscik, J. Morganroth and C. G. Cayten, "Prehospital Cardiac Care: Illusion of Consensus." Journal of the American College of Emergency Physicians 6, No. 12, 552-555, December 1977.

Cole, L., J. Sims, S. Otterbein, R. Staroscik, J. Morganroth, K. Walker, D. Lebisly and C. G. Cayten, "Clinical Algorithms as a Teaching Tool." EMT Journal 2, No. 3, 61-64 (September 1978).

TITLE: The Effect of Telemetry on Advanced  
Life Support Care

GRANT NUMBER:  
1 R18 HS 03555

GRANTEE INSTITUTION: Trustees, University of  
Pennsylvania

PROJECT PERIOD:  
09/30/79-09/29/82

PRINCIPAL INVESTIGATOR:

AUTHORITY: 1205/EMS

C. Gene Cayten, M.D.

University of Pennsylvania

FUNDING LEVEL:

Emergency Health Services

FY 79 \$169,511

3609 Locust Walk/C9 Room 302

FY 80 \$201,423

Philadelphia, Pennsylvania 19104

FY 81 \$157,000

(215) 243-6304

#### OBJECTIVE:

To evaluate the effects of telemetry on the treatment of patients suffering from life threatening cardiac dysrhythmias by Emergency Medical Technicians trained to perform Advanced Life Support ("paramedics"). Telemetry is the radio transmission of electrocardiographic signals by the paramedic in the field to the Emergency Department so that a physician can direct and monitor the prehospital phase of cardiac care.

#### SCOPE:

Philadelphia is an urban community which presently responds to heart attack emergencies with trained personnel equipped with medications and electrical devices to restore heartbeat. The investigators will determine the value of augmenting the Advanced Life Support System with telemetry. After rescue personnel have been tested for their ability to recognize abnormal cardiac rhythms, half of the teams (selected randomly) will transmit electrocardiograms as part of their resuscitation procedures and the other half will continue present procedures. Comparisons will be made of: 1) the paramedic ability to recognize dysrhythmias, 2) the paramedics' field identification of dysrhythmias, 3) physician and paramedic accuracy of EKG interpretation, 4) the quality of telemetered EKGs, and 5) the effect on survival rates of patients with ventricular fibrillation.

#### FINDINGS:

Federal policy holds that an Emergency Medical Services system which provides Advanced Life Support must use telemetry to insure medical control of the steps in cardiac resuscitation. Telemetry is extremely expensive to install and maintain, however, and a number of well-established and very effective systems which employ highly trained rescue personnel no longer use their telemetry equipment. If valid information can be produced to show that training and communication by voice alone makes telemetry unnecessary, the findings would be of great importance to many communities seeking to establish Advanced Life Support.



TITLE: Quantification of Injury and  
Critical Illness

GRANT NUMBER:  
5 R18 HS 02559

GRANTEE INSTITUTION: Washington Hospital  
Center

PROJECT PERIOD:  
06/30/76-12/31/80

PRINCIPAL INVESTIGATOR:  
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(202) 541-7257

AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 76 \$151,290  
FY 77 \$152,500  
FY 78 \$147,529  
FY 79 \$ 89,788  
FY 80 \$ 49,826

#### OBJECTIVE:

To develop indices of patient status which can be used both to improve and to evaluate the effectiveness of trauma care in both the prehospital and in-hospital phases of management.

#### SCOPE:

Using a variety of statistical and mathematical techniques, patient data will be used to develop injury severity scores and indices which correlate with probability of survival. For the prehospital phase of care, a Triage Index will be developed and tested which characterizes the cardiovascular, respiratory and central nervous system status of the patient, using data easily acquired by paramedical or nursing personnel. The study will also evaluate indexes which characterize the patient in terms of probability of survival and characterize severely injured patients during their in-hospital critical care. Analyses will include significant, therapeutic or diagnostic interventions required in patient management. The result is expected to be a methodology for detailed evaluation of care of the trauma patient.

#### FINDINGS:

The Triage Index has been developed and tested. Working with various clinicians and researchers throughout the United States, this has been further extended to provide a prehospital trauma score with applications in evaluation of prehospital care and in prehospital triage within regional EMS systems. Various combinations of the indexes have been used in developing a methodology for quality of care evaluation for the trauma patient. A discrete and detailed methodology will be available as a product of this research project.

Champion - HS 02559

PUBLICATIONS AND PRESENTATIONS:

Champion, H.R. and W.J. Sacco, "Triage by Protocol." Emergency Medical Services Research Methodology Workshop 2. NCHSR Research Proceedings Series, DHEW Publication No. (PHS) 79-3225-2. National Center for Health Services Research, 1978.

Champion, H.R., W.J. Sacco, D.S. Hannan, R.L. Lepper, E.S. Atzinger, W.S. Copes and R.H. Prall, "Assesement of Injury Severity: The Triage Index." Critical Care Medicine 8, No. 4, 201-208 (April 1980).

Champion, H.R., W.J. Sacco, R.L. Lepper, E.S. Atzinger, W.S. Copes and R.H. Prall, "An Anatomic Index of Injury Severity." The Journal of Trauma 20, No. 3, 197-202 (March 1980).



TITLE: Development of Paramedic Evaluation  
Components

GRANT NUMBER:  
1 RO3 HS 04160

GRANTEE INSTITUTION: University of Minnesota

PROJECT PERIOD:  
07/01/80-06/30/81

PRINCIPAL INVESTIGATOR:

AUTHORITY: 1205/EMS

Thomas Choi, Ph.D.

University of Minnesota

FUNDING LEVEL:

Center for Health Services Research

FY 80 \$ 40,247

1350 Mayo Memorial Building

Minneapolis, Minnesota 55455

(612) 376-2531

#### OBJECTIVE:

To develop and validate indices of patient health status/outcome for eventual use in measurement of paramedic performance.

#### SCOPE:

Severity, stability, criticality and prognostic indices comprising a prehospital criticality index will be designed to measure the effectiveness of paramedic care for non-traumatic chest pain patients. The indices will be developed by a five member physician panel having cardiology and emergency medicine training. Estimates of the severity, stability and criticality of patients in the hospital will be correlated with the intensity of care provided by trained clinicians. Intensity-of-care data will be collected by paramedics (confirmed by observers) in four different EMS systems over a six to eight month period. Data will be collected for an estimated 200 to 400 chest-pain patients of varying severity. Validation of the composite performance measures and evaluation of the paramedic performance will await future studies.

#### FINDINGS:

The results of this study would permit assessment of paramedic performance based upon outcome of care. Immediate cost savings will be possible through improving the cost-effectiveness of paramedic training. Additional implications may involve the relative cost-effectiveness of basic EMTs, basic EMTs with special defibrillation training, and paramedics. A prehospital criticality index may also serve as a prehospital triage index, permitting determination of the appropriate level of in-hospital care required.

Preliminary data show that a criticality index can accurately predict independently developed global patient criticality scores. The prognostic index also shows a relationship with the criticality index, lending confidence to the validity of both indices at this preliminary stage.

TITLE: Behavioral Outcome in Head Injury

GRANT NUMBER:  
1 R01 HS 04146

GRANTEE INSTITUTION: University of  
Washington

PROJECT PERIOD:  
09/01/80-08/31/82

PRINCIPAL INVESTIGATOR:  
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Department of Rehabilitation Medicine  
University of Washington  
Seattle, Washington 98195  
(206) 543-8660

AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 80 \$118,417  
FY 81 \$140,000  
FY 82 \$135,000

#### OBJECTIVE:

To determine the predictive utility of several severity indices, the neuropsychological and psychosocial consequences of head injuries and the recovery of function in these areas in relation to the long-term behavioral outcome for head trauma. The feasibility of identifying a short battery of measures sensitive to behavioral sequelae will also be measured and tested.

#### SCOPE:

Sixty-eight adults with head trauma of varying severity will be followed in a longitudinal study of one year. They will be compared with 68 normal controls matched by age, sex, race and education. The severity of injury will be evaluated at fixed time points during the first year after trauma for levels of impaired consciousness, specific neurological signs and various cognitive functions. Both groups will be subjected to an extensive battery of neuropsychological and daily activities measures administered at determined points during the first year post-injury. The study design will permit determination of outcome, neuropsychological and daily activities impairment and recovery potential in these domains and development of a single predictive measure of outcome for head trauma patients. Based on available data on head injured patients, the feasibility of developing a short battery of measures sensitive to the major categories of neuropsychological and psychosocial deficits will be empirically examined and cross validated by means of data from the present study.

#### FINDINGS:

Medical advances in recent years have increased the chances of survival for patients with head injuries. Increases in morbidity have in consequence made additional demands for rehabilitative services which attempt to restore these patients to better levels of functional ability. Measures of these functions are at present limited, cumbersome and imperfect. Findings from this grant should make a significant contribution to both the precision and ease of measurement which should be valuable not only in measuring behavioral outcomes but as a predictive measure of the value and kinds of rehabilitative services that are most suitable for patients with head trauma. A modification of the Sickness Impact Profile (SIP), suited for head trauma patients, is an anticipated consequence of this research activity.

TITLE: Instant CPR Instruction Via Phone

GRANT NUMBER:

1 R18 HS 04000

GRANTEE INSTITUTION: King County Public  
Health Department

PROJECT PERIOD:

01/01/81-06/30/82

PRINCIPAL INVESTIGATOR:

Mickey S. Eisenberg, M.D.

Project Restart

Seattle-King County Department  
of Public Health

508 Smith Tower

506 Second Avenue

Seattle, Washington 98104

(206) 344-3410

AUTHORITY: 1205/EMS

FUNDING LEVEL:

FY 81 \$103,509

FY 82 \$ 52,354

#### OBJECTIVE:

To design and test a method for providing instruction in cardiopulmonary resuscitation (CPR) by telephone to persons calling for emergency care in cases of cardiac arrest.

#### SCOPE:

Emergency dispatchers in King County, Washington, will be trained to offer instructions to callers who are present at the scene of a cardiac arrest and are willing to perform CPR until professional EMS personnel arrive. Formative evaluation will be carried out to ensure that the instructions delivered will achieve the desired response from previously untrained lay persons and from those previously trained but unsure of their skills.

#### FINDINGS:

Previous research has established an important relationship between survival of cardiac arrest and the time that elapses before CPR is begun. There is also evidence that CPR may help the victim of cardiac arrest to survive even though its performance is far below professional standards. Citizen CPR training in Seattle seems to have achieved its maximum effect upon the likelihood that a bystander will give aid in a case of cardiac arrest. This relatively inexpensive intervention would aim to achieve the most immediate possible use of CPR in the largest possible proportion of cardiac arrests. The potential effect upon lives saved is of considerable practical significance.

TITLE: Regional Neonatal EMS Service in  
Newborns Under 2500 Grams

GRANT NUMBER:  
1 R18 HS 03832

GRANTEE INSTITUTION: Health Policy Analysis  
and Accountability  
Network

PROJECT PERIOD:  
03/01/80-05/31/82

PRINCIPAL INVESTIGATOR:  
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School of Medicine  
550 First Avenue  
New York, New York 10016  
(212) 340-6245

AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 80 \$145,031  
FY 81 \$138,523

#### OBJECTIVE:

To evaluate the effect on neonatal mortality of the neonatal transportation of infants weighing less than 2500 grams at birth to regional special care units.

#### SCOPE:

The approach will be a comparison of two groups of infants followed from birth to death or discharge from the hospital. The study group will consist of infants transported from local hospitals to regional facilities with special care capabilities. The control group will be non-transported infants in lower level facilities, matched to the study group infants for birthweight, gestational age, medical condition, and type of hospital at birth. Charts of newborns weighing less than 2500 grams at birth will be audited at all New York City Hospitals. Severity will be estimated using modifications of the Lubchenko index and six-hour respiratory distress scores. During the first year of the project a feasibility study will be conducted to determine data availability and suitability of the design, and to refine the plan for analysis.

#### FINDINGS:

It is expected that non-transported neonates of low birthweight will have a significantly higher mean mortality rate than those transported for special care. Additionally it is expected that time of pickup and temperature of the infant at time of pickup will affect mortality rates. Regionalization is an important Federal emphasis in EMS, but there is little evidence as to its effect upon patients. This study should provide such information in one of the important patient groups targeted by EMS systems.



TITLE: An Evaluative Study of a 911 System

GRANT NUMBER:  
1 RO3 HS 04370

GRANTEE INSTITUTION: University of Miami

PROJECT PERIOD:  
02/01/81-07/31/81

PRINCIPAL INVESTIGATOR:

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AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 81 \$ 44,477

#### OBJECTIVE:

To determine the impact of the introduction of the "9-1-1" emergency telephone number on the prehospital emergency medical services system in a community.

#### SCOPE:

The study will utilize the fire alarm reports which capture the actions of the prehospital medical care system from the time of the initial distress call through the provision of emergency care. Demands on the system in terms of volume and inappropriate use will be examined for one-year periods before and after the initiation of the single-number access capability. A comparison will be made of 1) source of the call, 2) time of day, 3) incident location, 4) response time, and 5) discrepancies between the situation reported and the situation found by the emergency medical personnel before and after implementation of the "9-1-1" system.

#### FINDINGS:

The EMS Systems Act calls for a "9-1-1" capability in a fully developed EMS System. By eliminating the need to remember separate seven-digit phone numbers for police and fire departments and ambulance services, the "9-1-1" system provides a quick and effective mechanism for summoning emergency assistance. The impact of this greater accessibility on the Emergency Medical Services System needs to be assessed. This study will examine the impact and yield information of value to EMS planners and administrators.

TITLE: A Critical Examination of the  
Illinois Trauma System

GRANT NUMBER:  
5 RO1 HS 02118

GRANTEE INSTITUTION: University of Illinois

PROJECT PERIOD:  
06/30/76-06/30/80

PRINCIPAL INVESTIGATOR:  
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AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 76 \$153,498  
FY 77 \$ 93,602

#### OBJECTIVE:

This study critically examines the Illinois Trauma System. Four inter-related objectives provide the focus for this project: 1) investigation of factors determining hospitalization for patients with traumatic injuries; 2) evaluation of the completeness and validity of the Illinois Trauma Registry (ITR); 3) development and testing of a methodology for collecting post-hospital health status measures for trauma victims; and 4) development and validation of an index to grade injury severity retrospectively.

#### SCOPE:

Data are being collected from: 1) all Trauma Centers in downstate Illinois (n=33) for the Registry evaluation and hospital utilization study; 2) forty-three non-center hospitals for the hospital utilization study; 3) two hospitals in suburban Chicago for the post-hospital discharge health status study; 4) the National Hospital Discharge Survey for the development of an index of severity.

#### FINDINGS:

Preliminary findings indicate that nearly half of all trauma patients were hospitalized at Trauma Centers. A high proportion of non-whites, individuals injured in vehicular accidents, ambulance arrivals, transfers, and those admitted to Intensive Care Units received care at Trauma Centers. The evaluation of the ITR found it to be only 36% complete and systematically biased toward the more severe injuries, casting doubt on the usefulness of the Registry for evaluating trauma system effectiveness or recommending policy changes. A mailed survey was developed to ascertain the post-hospital health status of trauma victims, but difficulties relating to patient confidentiality and low response rates (24%) have not been overcome. An index of injury severity (the Estimated Survival Probability or ESP index) was developed based entirely on the diagnostic information readily available from the medical record. The ESP index correlates well with outcome and should prove valuable in future studies of traumatic injuries.

PUBLICATIONS.

Goldberg, J., H. M. Gelfand and P.S. Levy, "Registry Evaluation Methods: A Review and Case Study." Epidemiologic Reviews (forthcoming, 1980).

Goldberg, J., H.M. Gelfand, P.S. Levy and R. Mullner, "An Evaluation of the Illinois Trauma Registry." Medical Care 18, 520-531 (May 1980).

Goldberg, J., H.M. Gelfand, P.S. Levy, R. Mullner, J. Boren and N. Iverson, "Trauma Center Utilization in Illinois." Emergency Medical Services 9, 34-37, 39 (July/August 1980).

Levy, P.S., R. Mullner, J. Goldberg and H.M. Gelfand, "Measuring Trauma Severity: Comment on Krischer's Critique of the ESP Index." Health Services Research 13, 434-438 (Winter 1978).

Levy, P.S., R. Mullner, J. Goldberg and H.M. Gelfand, "The Estimated Survival Probability Index of Trauma Severity." Health Services Research 13, 28-35 (Spring 1978).



TITLE: Hospital Emergency Services

GRANT NUMBER:

3 RO1 HS 02538

GRANTEE INSTITUTION: Regents of the University  
of Michigan

PROJECT PERIOD:

06/30/76-08/31/80

PRINCIPAL INVESTIGATOR:

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AUTHORITY: 1205/EMS

FUNDING LEVEL:

FY 76 \$123,290

FY 77 \$225,498

FY 78 \$157,920

FY 79 \$ 97,733

#### OBJECTIVE:

To describe the organization and assess the effectiveness of hospital emergency care facilities.

#### SCOPE:

This comparative study of a carefully-drawn sample of 30 hospital emergency services has examined their efficiency, quality of service, responsiveness to community expectations, and staff and patient satisfaction. These variables are being related to characteristics of their organization and management. Data were collected by interviews with administrators, physicians, nurses, community representatives and patients; records were used to corroborate or supplement interview data.

#### FINDINGS:

Analysis is proceeding of the complex relationships between the organization and operation of an Emergency Department and the effectiveness of such units. Information about these relationships is needed not only for health planning activities but for immediate decisions which face hospital administrators daily--for example, the rapid proliferation of contract organizations which operate emergency facilities as a "franchise" may have important effects on both efficiency and effectiveness.

PUBLICATIONS AND PRESENTATIONS:

Argote, L.M., "Input Uncertainty and Organizational Problem Solving in Hospital Emergency Service Units." (Carnegie-Mellon University, Pittsburgh, April 1980) and presented at the 40th Annual Meeting of the Academy of Management, Detroit, Michigan (August 1980).

Argote, L.M., "Input Uncertainty, Organizational Problem Solving and Effectiveness in Hospital Emergency Service Units." Ph.D. Dissertation, University of Michigan (1979).

Georgopoulos, B.S., "An Open-System Approach to Evaluating the Effectiveness of Hospital Emergency Departments." Emergency Medical Services 7, 118-129 (November-December 1978).

Georgopoulos, B.S. and R.A. Cooke, "Conceptual-Theoretical Framework for the Organizational Study of Hospital Emergency Services." Working Paper Series #8011, Institute for Social Research, University of Michigan at Ann Arbor (1979) and presented at the 40th Annual Meeting of the Academy of Management, Detroit, Michigan (August 1980).

Georgopoulos, B.S., et al., A Comparative Study of Hospital Emergency Services: Special Report to Participating Institutions. (Institute for Social Research, University of Michigan, Ann Arbor, 1978).

Georgopoulos, B.S., R.A. Cooke and Associates, A Comparative Study of the Organization and Performance of Hospital Emergency Services. (Institute for Social Research, University of Michigan, Ann Arbor, 1980).

Peterson, M.F., "Problem-Appropriate Leadership in Hospital Emergency Units." (Wayne State University, Detroit, Michigan, 1980) and presented at the 40th Annual Meeting of the Academy of Management, Detroit, Michigan (August 1980).

Peterson, M.F., "Problem-Appropriate Leadership in Hospital Emergency Units and Its Relation to Selected Organizational Variables." Ph.D. Dissertation, University of Michigan (1979).

Uhlaner, L.M., "Management of the Coordination Problem in Hospital Emergency Units." Ph.D. Dissertation, University of Michigan (1980).

Uhlaner, L.M., "Management of the Coordination Problem in Hospital Emergency Units: A Role Theory Approach." Presented at the 40th Annual Meeting of the Academy of Management, Detroit, Michigan (August 1980).

Uhlaner, L.M., "Minimizing Delay in Hospital Emergency Units: An Organization Approach." (Michigan State University, East Lansing, Michigan, 1980) and presented at the Annual Meeting of the University Association for Emergency Medicine, Tucson, Arizona (April 1980).

Georgopoulos - HS 02538

Uzun, N.E., "A Study of Hospital Emergency Units Adapting to Their Social Environments: An Interorganizational Cooperation Perspective." Ph.D. Dissertation, University of Michigan (1980).

Uzun, N.E., "Interorganizational Cooperation and Adaptation of Hospital Emergency Units to Their Social Environments." (Veterans Administration Health Services Research Program, Ann Arbor, Michigan, 1980) and presented at the Department of Medical Care Organization (School of Public Health) Seminar Series (February 1980).

TITLE: EMS Severity Index Research

GRANT NUMBER:

5 R18 HS 02621

GRANTEE INSTITUTION: University of Wisconsin

PROJECT PERIOD:

07/01/77-05/31/80

PRINCIPAL INVESTIGATOR:

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AUTHORITY: 1205/EMS

FUNDING LEVEL:

FY 77 \$177,864

FY 78 \$234,453

#### OBJECTIVE:

To develop and test a useful and practical method for constructing severity indexes for use in emergency medical services. With the techniques of decision theory and the multidimensional scaling methods of multiattribute utility theory, information from panels of experts was gathered, organized, and applied to the development of indexes for victims of multiple trauma and ischemic heart disease.

#### SCOPE:

Panels of physicians were assembled. For heart disease, their selection was systematically varied to include EMS physicians, specialists and a mixture of both. Panels were convened to develop indexes for two conditions: cardiac emergencies and multiple trauma that might present in the emergency department. The first condition was presented to three panels in Wisconsin, one in Ohio, one in Michigan, and one in Maine. The elements these experts used to estimate the seriousness of medical emergencies were identified and the methods of decision theory and utility theory were used to assign weights to these elements and to arrange them in the form of indexes. A high degree of agreement was found on the weighted elements in the cardiac index and a similar approach was therefore used to classify patients with multiple trauma. These indexes were derived from expert opinion and their predictive value was examined using actual clinical data from hospitals in several localities.

#### FINDINGS:

Indexes obtained from different mixes of experts in different sites showed considerable agreement upon the clinical factors which determine the severity of cardiac and trauma emergencies. When these indexes were used to classify patients in various hospitals, substantial differences in treatments and in outcomes were noted. The primary emphasis in this research was on methodology development and, to that end, four index development strategies were employed and the results were cross tabulated to determine the one which performed best--multiattribute utility modelling (MMAU). Also indexes developed by outside groups using this methodology were similar in configuration, and, in some cases, superior in predictive ability to the initial index, indicating that the methodology developed in this research can be successfully applied by others.



TITLE: Emergency Medical Service  
Effectiveness Research

GRANT NUMBER:  
1 RO1 HS 03819

GRANTEE INSTITUTION: University of Wisconsin PROJECT PERIOD:  
09/15/79-09/14/82

PRINCIPAL INVESTIGATOR:  
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AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 79 \$418,902  
FY 80 \$507,769  
FY 81 \$387,242

#### OBJECTIVE:

To measure and explain the effect of categorizing hospitals on clinical outcome and to describe and evaluate the effectiveness of current transfer practices in emergency cardiac and trauma care.

#### SCOPE:

This research will compile and examine hospital record abstracts for 13,500 cases. Hospitals to be studied will represent three levels of categorization, and three geographic locations, as follows: Thirty-one hospitals from Maine (where categorization is integrated into advanced EMS systems), 15 from Green Bay, Wisconsin (where a categorization system has recently been introduced), and 15 from Madison, Wisconsin (where no formal categorization exists as yet). Severity indices developed at the University of Wisconsin will be used to classify patients into comparable groups. Multivariate analysis will estimate the extent to which the categorization efforts have affected patient outcomes and actual transfer practice. Site visits, record reviews and epidemiological analyses will be used to help explain results.

#### FINDINGS:

Most of the first year of this project was spent in refinement of the theoretical model and testing of the measures and data collection procedures. A policy and procedures manual has been prepared which details administrative and data collection procedures for the three study sites. An index of patient morbidity has been developed and informally tested and is being validated. Indexes of quality of cardiac care have been developed and validation tests are forthcoming. A quality index for trauma is under development. Data collection forms and guidelines have been developed and tested. Participation has been arranged with most of the hospitals selected for inclusion in the study. Full-scale data collection began in July, 1980. Categorization (or regionalization) of facilities is one of the principal emphases of Federal policy in emergency care.

TITLE: Severity Index Conference

GRANT NUMBER:

1 R13 HS 04149

GRANTEE INSTITUTION: University of Wisconsin

PROJECT PERIOD:

05/01/80-04/30/81

PRINCIPAL INVESTIGATOR:

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FUNDING LEVEL:

FY 80 \$ 35,000

#### OBJECTIVE:

To identify the critical strengths and weaknesses of various approaches to severity index construction for trauma; to determine the boundaries of use of various trauma indices; to avoid duplication of effort in severity index development; and to determine the most productive paths for future research in the severity index field.

#### SCOPE:

Conference participants included the major developers of severity indices for trauma and methodologists skilled in the theoretical underpinnings of index development. These participants were drawn from disciplines of clinical medicine, decision theory, and statistics to realize the objectives of the conference. Some users of severity indices were also invited. As a result of a set of intensive pre-conference activities, including a survey of developers, the conference attempted to develop a set of criteria and tests against which given indices could be judged by both developers and users. Among those indices were the AIS-80 (developed by Baker, et. al.), the RESP (developed by Levy and Goldberg), the Anatomic Index, the Triage Index and the Shock Index (all developed by Champion and Sacco), the Wisconsin Trauma Severity Index (developed by Gustafson, Rowe and Fryback, et. al.) and the Abbreviated Burn Severity Index (developed by Edlich and Hiebert).

#### FINDINGS:

1) Criteria were developed prior to and during the conference for evaluating the usefulness of severity indices. These criteria, though imperfect, represent the beginnings of an evaluation protocol. 2) The conference concluded that no single severity index is ready for uniform acceptance although a number are ready for field testing, and conference participants agreed that collaborative testing of the indices is needed. 3) The Triage Index developed by Champion and Sacco at the Washington Hospital Center was revised at the conference and labeled the Trauma Severity Score (TSS). The data elements in the TSS were considered by physicians attending the con-

ference to be appropriate components in a minimum data set in prehospital and ED care. (Subsequent evaluation indicates the revised Trauma Severity Score may not perform as well as the original Triage Index.) 4) The AIS-80 was considered to have substantial promise, but the conference suggested that it be revised to improve face validity. That revision has taken place. 5) The Wisconsin Trauma Severity Index was considered to have substantial potential for evaluating in-hospital care but not for prehospital care. 6) Conference participants agreed to assist in the task of restructuring the ICD-N codes in order to more precisely define and classify injuries. 7) An index of morbidity was considered important to develop, and conference participants concluded that a follow-up conference is needed to report on progress in the development and testing of both severity and morbidity indices.



TITLE: Crisis Intervention for EMTs  
and Nurses

GRANT NUMBER:  
1 R18 HS 03334

GRANTEE INSTITUTION: University of Georgia

PROJECT PERIOD:  
07/01/79-06/30/80

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AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 79 \$ 50,155

#### OBJECTIVE:

To develop, implement, and evaluate a comprehensive program for training Emergency Medical Technicians and Emergency Nurses to understand the psychosocial needs of patients undergoing behavioral emergencies.

#### SCOPE:

A model of crisis-formation is employed to guide the program which is delivered in two 16-hour sessions separated by a two-week break. Teaching techniques included lecture, discussion, role play, problem-solving, questionnaires and audio-visual presentations. The evaluation employed an untrained comparison group to assess the effect of the training program upon EMT and RN communication skills, attitudes, and knowledge as measured by paper-and-pencil methods.

#### FINDINGS:

EMTs and Emergency Nurses will learn to understand underlying motivations of behavior and basic principles of psychological intervention and communication skills intended to result in more efficient and appropriate management of crisis situations, increase overall on-the-job effectiveness and job satisfaction, and reduce inappropriate use of transportation and hospitalization. On three of the measures of learning, the trained subjects scored significantly higher than the controls.

Hampton - HS 03334

PUBLICATION:

Hampton, L.A., "Crisis Intervention." Emergency 12, No. 5, 59-60 and 68-69 (May 1980).

TITLE: Assessing Alternative EMS System  
Improvements

GRANT NUMBER:  
1 R21 HS 03245

GRANTEE INSTITUTION: University of Iowa

PROJECT PERIOD:  
09/01/78-02/29/80

PRINCIPAL INVESTIGATOR:

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AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 78 \$ 37,209

OBJECTIVE:

To determine the availability of data on distribution of EMS resources, to judge the value of those data to explain inequities and deficiencies in the current distribution of resources, and to construct a mathematical model for planning and evaluating alternative strategies to improve the distribution of EMS resources.

SCOPE:

By using a location-allocation algorithm together with a geographic information system, existing data for a 23-county EMS region (Southeast Iowa EMS) were compiled and analyzed to determine the equitability and efficiency of distribution of EMS resources. The feasibility of designing and testing a mathematical model to improve decisions about allocating resources is addressed.

FINDINGS:

Results suggest methods for more rational resource allocation decisions among the 15 system components mandated in the EMS Act and Amendments, decisions of particular concern in rural and remote EMS systems. The project has implications for health planning regulations as well.

TITLE: Factors Determining Outcome of  
Hospitalized Trauma

GRANT NUMBER:  
7 RO1 HS 04029

GRANTEE INSTITUTION: University of Illinois

PROJECT PERIOD:  
09/30/78-09/30/81

PRINCIPAL INVESTIGATOR:

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AUTHORITY: 1205/EMS

FUNDING LEVEL:

FY 78 \$ 51,329

FY 79 \$ 44,386

#### OBJECTIVE:

The overall objective of this project is 1) to develop an improved version of the estimated survival probability index (ESP), and 2) to investigate the nature and strength of relationships between outcome of hospitalized trauma and such factors as age, sex, race, and initial severity. The second year of the investigation will concentrate on factors determining the outcome of hospitalized trauma, such as discharge status, and length of hospital stay.

#### SCOPE:

Data to be analyzed were collected in the Hospital Discharge Survey between 1971-75. The Hospital Discharge Survey was a national survey on non-federal short-stay hospitals conducted by the National Center for Health Statistics. Data are abstracted from face pages of sample medical records of discharged patients. A case-control methodology will be used on all patients discharged dead (approximately 1,500) and a stratified random sample of about 3,000 patients discharged alive. Contingency tables will be used to test appropriate hypotheses. This index will be a useful tool in understanding the factors associated with trauma and in conducting other studies.

#### FINDINGS:

Among the priorities of NCHSR are EMS research and evaluation of medical care. These investigators are now making available a computer tape (with documentation) giving the final single condition survival rate to other investigators. With this tape, the ESP index can be computed simply from the listed ICDA codes on the medical records. This is the first study to examine outcome of hospitalized trauma against such variables as race, number of hospital beds and geographic division, controlling for such variables as age and severity of injury.

PUBLICATIONS AND PRESENTATIONS:

Levy, Paul S., Goldberg, J., Iverson, N., Rothrock, J. and Lohr, W. The Revised Estimated Survival Probability Index of Trauma Severity. Presented at the 1980 Meeting of the University Associates in Emergency Medicine, held in Tucson, Arizona and also at the Severity Index Conference, held at Woodstock, Illinois, June 1980. To appear in the Proceedings of the Severity Index Conference which will be an NCHSR publication.

Levy, Paul S., Goldberg, J., Rothrock, J., Iverson, N. Factors Determining Survival Among Individuals Hospitalized with Trauma Conditions. To be presented as an Invited Paper at the 1981 Annual Meeting of the American Statistical Association. Also, to appear in the Proceedings of the Social Statistics Section of the American Statistical Association, 1981.



TITLE: Model for Criterion-Referenced  
Medical Specialty Test

GRANT NUMBER:  
1 R18 HS 02038

GRANTEE INSTITUTION: Michigan State  
University

PROJECT PERIOD:  
07/01/77-09/29/82

PRINCIPAL INVESTIGATOR:  
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Research and Development  
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AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 77 \$169,117  
FY 78 \$143,709  
FY 79 - 0 -  
FY 80 \$185,556  
FY 81 \$153,800

#### OBJECTIVE:

To evaluate a set of methods and procedures to develop, score, and interpret a criterion-referenced specialty certifying examination for physicians. A criterion-referenced examination is one requiring that certain absolute performance criteria be met, rather than one scoring performance relative to other scores achieved. The specific examination to be dealt with is that for the new specialty of Emergency Medicine. Objectives include: a) comparative evaluations of test formats; b) identifying cognitive domains within a complex specialty; c) methods of empirically referencing pass/fail test criteria to the quality of health care provided patients.

#### SCOPE:

During the first year, a field test involving 36 board eligible physicians, 36 residents in emergency medicine, and 22 senior medical students was carried out. Research was conducted on the reliability and validity of five different test formats and on several conceptual and methodological issues. Research findings were then employed to design the first certifying examination administered by the American Board of Emergency Medicine in the Spring of 1980.

#### FINDINGS:

Six hundred sixteen candidates participated in the Part I objective test which included clinically relevant multiple-choice questions, experimental basic science multiple-choice questions, pictorial multiple-choice questions and experimental Patient Management Problems. After passing Part I, 182 candidates took Part II which consisted of examiner-administered Simulated Patient Encounters and multi-patient Simulated Situation Encounters. The results of this field test will be used to design and carry out a full-scale effort on the reliability and validity of specific measures of clinical performance and of a criterion-referenced specialty certification examination. The ultimate utility of this information is its potential for improving the cost-effectiveness of specialty certification methods.

TITLE: Rural Volunteer Emergency  
Medical Coordinators

GRANT NUMBER:  
5 R18 HS 02507

GRANTEE INSTITUTION: Georgia Institute  
of Technology

PROJECT PERIOD:  
09/01/77-08/31/80

PRINCIPAL INVESTIGATOR:  
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AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 77 \$221,364  
FY 78 \$145,556  
FY 79 \$161,176

#### OBJECTIVE:

To demonstrate and evaluate the use of trained volunteer Emergency Medical Coordinators (EMCs) in 36 rural Georgia communities with populations under 2,000.

#### SCOPE:

Rural communities distant from emergency medical care have been selected. Volunteer EMCs have been recruited and trained, and are serving in the communities as first responders, coordinators of the ambulance response system, and health educators. They stabilize victims of emergencies until the official system can respond, distribute information on how to contact emergency aid, and conduct educational activities to improve the ability of people to recognize medical emergencies and avoid the situations that contribute to them. Data have been collected on the characteristics of the communities and the EMCs, the activities of the EMCs and the emergency incidents encountered, and the effect of the EMC upon community awareness and attitudes.

#### FINDINGS:

Preliminary findings suggest that the EMC program has had an effect upon knowledge of community residents of how to contact the Emergency Medical Services system. A total of 238 calls have been reported by EMCs; of these, 81 in which the EMC responded involved eventual transport by ambulance. Analysis of this group suggests that the EMC is able to respond within an average of less than four minutes, or 1.27 minutes plus one minute per mile of distance. This response level is of great potential value to rural communities, where time required for response by the official system can often be lengthy. Additional incident data have been collected and questions of adaptability to other communities are addressed.

TITLE: Complications in Prehospital  
Cardiac Resuscitation

GRANT NUMBER:  
7 R01 HS 02567

GRANTEE INSTITUTION: Johns Hopkins  
University

PROJECT PERIOD:  
09/01/77-11/30/80

PRINCIPAL INVESTIGATOR:  
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AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 77 \$199,591  
FY 78 \$200,566  
FY 79 \$158,058

#### OBJECTIVE:

To identify complications of prehospital administration of cardiopulmonary resuscitation (CPR) and observe associated factors.

#### SCOPE:

With the cooperation of the Miami EMS system and medical examiner, out-of-hospital incidents of CPR administration were identified. Medical examination of nonsurvivors, and hospital records and interviews of survivors, are used to identify adverse consequences of the intervention and characteristics of the victim (e.g., age, body weight). Ambulance records and rescuer interviews were used to determine relevant circumstances of the incident and characteristics of the rescuer.

#### FINDINGS:

Preliminary results suggest high frequencies of fractured ribs and aspiration pneumonitis, but so far show no evidence, as had been anticipated, of differences in injuries between survivors and nonsurvivors which might serve as measures of overall adequacy of CPR performance in an EMS system. Other indications will be sought of ways to improve the technique itself or the training of rescuers in its use. The knowledge gained in establishing the data collection system has also yielded information of value to future researchers dealing with data from ambulance, hospital, and medical examiner records. In addition, the information gathered on factors related to survival of incidents involving CPR can provide guidelines for monitoring performance of prehospital cardiac care.

PUBLICATIONS AND PRESENTATIONS:

Fine, E.G., E.L. Nagel, S. Shapiro, G. Gibson and N. Webb, "Complications in Prehospital Cardiac Resuscitation." Presented at the American Public Health Association Annual Meeting, Los Angeles, California (October 1978).

Fine, E.G. and N. Webb, "Do You Have the Right Time: An Analysis of the Validity of Response Time." Presented at the American Public Health Association Annual Meeting, Los Angeles, California (October 1978).

Fine, E.G., N. Webb and E.L. Nagel, "Errors of Omission: Deficiencies in Emergency Department Records of Cardiac Arrest Victims." Presented at the University Association for Emergency Medicine Annual Meeting, Tucson, Arizona (April 1980).

Fine, E.G., N. Webb and E.L. Nagel, "Prehospital Cardiac Resuscitation - A Profile of Patients and Outcomes." Presented at the American Public Health Association Annual Meeting, New York, New York (November 1979).

Fine, E.G., N. Webb and E. L. Nagel, "Variations on a Theme: Emergency Department Treatment of Prehospital Cardiac Arrests." Presented at the University Association for Emergency Medicine Annual Meeting, Tucson, Arizona (April 1980).



TITLE: Evaluation of an EMS Algorithm  
System

GRANT NUMBER:  
3 R18 HS 03094

GRANTEE INSTITUTION: American College of  
Emergency Physicians

PROJECT PERIOD:  
07/01/78-06/30/80

PRINCIPAL INVESTIGATOR:  
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AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 78 \$ 25,134  
FY 79 \$ 3,834  
FY 80 \$ 1,100

#### OBJECTIVE:

To evaluate and field test a set of diagnostic and treatment protocols and algorithms applicable to emergency medical care; to test a method of evaluating protocols and algorithms in terms of their medical logic and functional feasibility; and to derive some general rules for protocol and algorithm design, development, and use.

#### SCOPE:

A great many algorithms from a variety of sources have been assembled and screened initially for relevance to emergency care by a panel of Emergency Physicians from the American College of Emergency Physicians. Algorithms not relevant, and those deemed both relevant and immediately acceptable in all respects, have been identified. Of the remaining algorithms, those with questionable medical content are being subjected to further review and comments. Those with acceptable medical content are being field tested for acceptability in hospitals with Emergency Medicine residence programs and busy clinical services.

#### FINDINGS:

Findings from this study will contribute substantially to the development of nationally recognized standards of emergency medical care. The study will also establish guidelines for those desiring to develop emergency care algorithms and, more importantly, it will outline a feasible method of testing the medical validity and the practical utility of these algorithms as tools for training, quality assessment efforts, and staffing plans.



TITLE: Myocardial Infarction Prediction  
in Emergency Rooms

GRANT NUMBER:  
5 R01 HS 02068

GRANTEE INSTITUTION: Trustees of Health and  
Hospitals of the City of  
Boston, Inc.

PROJECT PERIOD:  
06/30/76-06/30/81

AUTHORITY: 1205/EMS

PRINCIPAL INVESTIGATOR:

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FUNDING LEVEL:

FY 76	\$145,770
FY 77	\$162,039
FY 78	\$434,559
FY 79	\$654,470
FY 80	\$329,145

OBJECTIVE:

To test the validity, reliability and utility of a mathematical model to predict acute ischemic heart disease in individual patients whose symptoms suggest the condition. The study is being conducted in six hospitals throughout New England in an effort to reduce inappropriate admissions to Coronary Care Units.

SCOPE:

The six hospitals, though randomly selected, represent major academic, teaching affiliates, and nonteaching institutions which care for all socio-economic groups. During the prospective phase of the study, the predictive model will be given to Emergency Room physicians to supplement their diagnostic and admission decisions. For one hospital group, the Emergency Room physicians will use the model on every eligible patient during the first six months of the study and have it withheld the last six months. For the second hospital group, the model will be given to the Emergency Room physicians during the alternate months. The predictive function is based on the physician's present intuitive approach involving the weighting of all relevant variables in reaching a diagnosis. This additional diagnostic tool is intended to improve Coronary Care unit admitting practices. Generalizability will be demonstrated by using this tool at six hospitals with varying characteristics, divergent physician practices, and different population characteristics.

FINDINGS:

Findings from the preliminary phase of the study, at Boston City Hospital, indicate that the use of the tool improved diagnostic accuracy and substantially reduced the rate of inappropriate CCU admission. Every patient admitted to a general medical ward rather than a CCU bed resulted in gross savings because the difference in per diem costs between CCU's and acute care beds was substantial. Even a modest improvement in diagnostic accuracy yields large benefits in addition to savings because of the physical and psychological side effects of an admission to the CCU. Analysis of the prospective study data should detect all of these differences with a very high probability.

PUBLICATIONS AND PRESENTATIONS:

D'Agostino, R.B. and M.W. Pozen, "Using the Logistic Function for Detecting Acute Coronary Heart Disease in Emergency Patients." Accepted for Applied Statistics.

D'Agostino, R.B., M.W. Pozen, et al., "Comparison of Logistic Regression and Discriminant Analysis as Emergency Room Decision Models for the Diagnosis of Acute Coronary Disease." Presented at the American Statistical Association Meetings, Chicago, Illinois (August 1977).

Pozen, M.W., R.B. D'Agostino, et al., "Relative Effectiveness of a Multiple Discriminant Model Versus Emergency Room Physicians in Diagnosing Acute Myocardial Ischemia." Presented at the American Federation for Clinical Research Meetings, Washington, D.C. (May 1977).

Pozen, M.W., R.B. D'Agostino, et al., "The Utility of a Predictive Model for Ischemic Heart Disease in Changing Hospital Admitting Practices. Presented to the American Federation for Clinical Research Meetings, San Francisco, California (May 1978).

Pozen, M.W., R.B. D'Agostino, J.B. Mitchell, et al., "The Usefulness of a Predictive Instrument to Reduce Inappropriate Admissions to the Coronary Care Unit." Annals of Internal Medicine 92, No. 2, 238-242 (February 1980).

Teebagy, N., R.B. D'Agostino, M.W. Pozen, et al., "A Sequential Diagnostic Procedure Incorporating the Logistic Regression." Presented at the American Statistical Association Meetings, Chicago, Illinois (August 1977).

TITLE: Confirmation Parameters to Assess  
EMTs' Decisions

GRANT NUMBER:  
5 R01 HS 02102

GRANTEE INSTITUTION: Trustees of Health and Hospitals of the City of Boston, Inc.

PROJECT PERIOD:  
07/01/77-02/28/80

AUTHORITY: 1205/EMS

PRINCIPAL INVESTIGATOR:  
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FUNDING LEVEL:  
FY 77 \$114,449  
FY 78 \$119,021  
FY 79 \$ 22,118

#### OBJECTIVE:

To assess the utility of patient outcome measures for confirming the effectiveness of the prehospital diagnostic and therapeutic abilities of EMTs and paramedics.

#### SCOPE:

The method focuses on the development of intermediate outcome measures called "proximate confirmation parameters." These are diagnostic and/or physiological measurements obtained in the emergency room (ER), and thus proximal in time to the prehospital phase of care. The measures will be used to assess the care provided by EMTs and paramedics (EMT/Ps). Proximal confirmation parameters were developed for three specific conditions in ascending order of methodological complexity for which EMT interventions exist: peripheral fractures, cardiac arrests and chest and abdominal traumas. As a result of the reorganization of the Boston City EMS system during the final year of the study, data collection was expanded to three additional hospital Emergency Departments: Carney Hospital, Massachusetts General and Tufts New England Medical Center. The study population was comprised of 225 patients with suspected peripheral fractures, 286 with cardiac arrest and 140 with chest or abdominal trauma cared for by EMT/P Technicians during a 2-year period.

#### FINDINGS:

For patients with suspected fractures the study assessed the diagnostic accuracy and splinting skills of EMT/Ps. Length of experience or caseload did not seem to influence EMT/P performance. Patients with chest/abdominal traumas were assessed by comparing prehospital systolic blood pressure (SBP) and double-product blood pressure with Emergency Department measures. The double-product measure seemed more sensitive in identifying patients with potentially unstable hemodynamics. Those so identified who were given intravenous fluids in the prehospital phase were more likely to be stabilized, as compared to those who were not so treated.

PUBLICATIONS AND PRESENTATIONS:

Pozen, M.W., R.B. D'Agostino, et al., "A Quantitative Assessment of the Potential Utility of Intravenous Fluids in Trauma Patients." Presented to the American Public Health Association's Annual Meeting in New York, New York (November 4-8, 1979).

Pozen, M.W., R.B. D'Agostino, et al., "A Set of Proximate Outcome Measures in the Emergency Room for Patients Splinted in Ambulances." Presented at the American Public Health Association Meetings (October 1978).

Pozen, M.W., D. Lerner, et al., "The Utility of Hemodynamic Parameters for Assessing Status and Course of Patients with Trauma." Emergency Medical Services Quarterly (Winter 1980).



TITLE: Effectiveness of Advanced EMTs  
Versus Basic EMTs

GRANT NUMBER:  
5 R01 HS 02536

GRANTEE INSTITUTION: Trustees of Health and  
Hospitals of the City of  
Boston, Inc.

PROJECT PERIOD:  
07/01/77-02/28/80

AUTHORITY: 1205/EMS

PRINCIPAL INVESTIGATOR:  
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FUNDING LEVEL:  
FY 77 \$ 91,992  
FY 78 \$107,468  
FY 79 \$ 61,865

#### OBJECTIVE:

To study the relative effectiveness of paramedics versus basic Emergency Medical Technicians in the delivery of prehospital care to suspected cardiac patients in a rural area.

#### SCOPE:

The study specifically seeks to use certain measures of both the process and outcome of care of EMT and Paramedic performance. The measures used are condition/symptom recognition, patient treatment and mortality rates. An EMT/paramedic experience index has been constructed. Adherence to protocols will be examined. The study will examine different rates of condition recognition among both groups according to geographic location, clinical experience, and patient characteristics, and a comparison will be made between ambulance and non-ambulance populations. Seasonal differences will also be examined since the rural setting is also a summer resort.

#### FINDINGS:

The effectiveness in prehospital cardiac care of paramedics trained for 300 hours beyond basic 81-hour training versus 81-hour trained basic Emergency Medical Technicians (EMTs) was examined in a comparative community-based study. The study population included all patients presenting with acute cardiovascular complaints. A quasi-experimental design was used to take advantage of operational constraints which rendered assignment of patients to paramedics and EMTs non-random. Over a three-year period, 55% of the 1,321 patients with a final diagnosis of acute ischemic heart disease were cared for by paramedics and 45% by EMTs. Patients in the two groups were retrospectively matched by condition, severity, and all relevant socio-demographic variables. Of patients treated by paramedics, not only were those in cardiac arrest more likely to survive, but patients with all cardiac conditions exhibited two-fold improvement in the odds for survival. This study confirms earlier evidence of the salutary effect of paramedic programs for those patients found in cardiac arrest and indicates that once an EMS program has matured, the population benefitting from paramedic programs extends to a broad range of acute cardiac patients.



PUBLICATIONS AND PRESENTATIONS:

D'Agostino, R.B., M.W. Pozen, et al., "Impact of Paramedic Programs on Community Mortality." Presented at the AFRC National Meeting in Washington, D.C. (May 10-12, 1980).

Mitchell, J., M.W. Pozen, et al., "Acute Cardiovascular Condition Recognition -- Emergency Medical Technicians Versus Paramedics." Presented to the American Public Health Association Meetings (October 1978).

Mitchell, J., M.W. Pozen, et al., "Implications of Alternative Sampling Strategies for Emergency Medical Service Evaluation." Presented at the American Federation for Clinical Research Meetings, San Francisco, California (May 1978) and Medical Care 17, 828-834 (August 1979).

Pozen, M.W., "Prehospital Coronary Care: The Current Case for a Paramedic Study." American Journal of Public Health 69, 1, 13-14 (January 1979).

Pozen, M.W. and M.M. Berezin, "Cost and Utility Considerations in Implementing Ambulance Telemetry." Heart and Lung (September-October 1980).

Pozen, M.W. and M.M. Berezin, "Implications of Paramedics' Diagnostic and Therapeutic Accuracy." Presented to the Annual Meeting of the American Federation for Clinical Research (May 1979).

Pozen, M.W. and M.M. Berezin, et al., "Ambulance Utilization by Patients with Acute Myocardial Infarction." American Journal of Public Health 68, No. 6, 568-572 (June 1978).

Pozen, M.W., M.M. Berezin, et al., "An Assessment of Emergency Medical Technicians' Performance as Related to Seasonal Population Influx." Journal of Community Medicine 3, No. 3 (Spring 1978).

Pozen, M.W., M.M. Berezin, et al., "Differential Impact of Paramedic Interventions on Emergency Room Versus Hospital Mortality." Presented to the American Heart Association Annual Meeting (November 12-15, 1979).

Pozen, M.W., M. Berezin, et al., "Effects of Population Influx on EMTs Performance." Presented at the American Public Health Association Meetings, Miami Beach, Florida (October 1976).

Pozen, M.W., P.A. Sytkowski and R.B. D'Agostino, "Effectiveness of a Prehospital Medical Control System: An Analysis of the Emergency Room Physician/Paramedic Interaction." Circulation (February 1981).

Sytkowski, P.A., M.W. Pozen and R.B. D'Agostino, "An Analytic Method for the Evaluation of Rural Emergency Medical Service Development." Medical Care (Winter 1981).

TITLE: Impact of EMS System Development  
in Rural Areas

GRANT NUMBER:  
1 R18 HS 03826

GRANTEE INSTITUTION: Trustees of Health and  
Hospitals of the City of  
Boston, Inc.

PROJECT PERIOD:  
09/30/79-09/29/83

AUTHORITY: 1205/EMS

PRINCIPAL INVESTIGATOR:  
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FUNDING LEVEL:  
FY 79 \$301,053  
FY 80 \$476,485  
FY 81 \$377,194  
FY 82 \$304,252

#### OBJECTIVE:

To measure the effectiveness of incremental improvements in rural EMS systems in terms of reductions in death and disability from heart disease.

#### SCOPE:

The utilization, treatment, and results of emergency care in three rural EMS systems differing in their level of sophistication will be compared. A Basic Life Support system in western Massachusetts, a system in West Virginia in transition to paramedic-staffed Advanced Life Support, and a fully-implemented Advanced Life Support system in Cape Cod, Massachusetts, will be examined at three points in time. Analyses will include the accuracy of diagnosis, appropriateness of treatment, and results of care for patients with cardiac emergencies.

#### FINDINGS:

Procedures are in operation for collecting complete and accurate data from each research setting, and full cooperation has been gained from ambulance systems, hospitals, and health departments. Data collection is proceeding well and preliminary analyses have demonstrated that an adequate number of cases will be available for study. This project is obtaining information about the care of heart attack victims in rural areas, the effectiveness of regional EMS systems in improving cardiac care, and the extent to which each of the elements comprising the system contributes to lowering mortality. Because rural areas are characterized by longer response times, fewer calls per technician (and therefore less field experience), and higher costs per run, it is important to understand the extent to which the mandates of the Federal EMS program, designed primarily for high population density areas, can be expected to improve cardiac care in rural settings.

TITLE: Measurement of EMT Performance

GRANT NUMBER:

3 R01 HS 02702

GRANTEE INSTITUTION: University of Michigan

PROJECT PERIOD:

07/01/77-06/30/80

PRINCIPAL INVESTIGATOR:

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AUTHORITY: 1205/EMS

FUNDING LEVEL:

FY 77 \$166,292

FY 78 \$160,498

FY 79 \$ 6,877

FY 80 \$ 27,583

#### OBJECTIVE:

To develop a method for assessing the performance of emergency medical technicians (EMTs) and paramedics.

#### SCOPE:

Specially trained observers have accompanied ambulance runs to collect data on the decisions and treatments of emergency medical technicians and paramedics in urban and rural areas in a single EMS system. A series of proficiency tests are also being used to evaluate the general level of EMT and paramedic performance. The validity of the performance assessment will be evaluated by comparison with self-reports and with other accepted proficiency tests. Observers are guided by instruments designed to maximize the completeness and objectivity of the data, and simulated emergency incidents have been used to test the reliability and validity of their observations.

#### FINDINGS:

The assessment of performance of these technicians has provided some indication of what training they need, what types of individuals should be trained, what degree of experience is critical for a defined level of care, and what quality assurance mechanisms are required. Preliminary analysis has shown the power of the method to detect performance deficiencies as compared with routine performance monitoring methods. In order to examine the extent of this information gain, which could be enormously important to system managers, plans are being made to repeat the study in several "mature" systems.

TITLE: Reliability and Validity Testing  
of the AIS and ISS

GRANT NUMBER:  
1 R18 HS 03606

GRANTEE INSTITUTION: Johns Hopkins  
University

PROJECT PERIOD:  
09/30/79-03/31/80

PRINCIPAL INVESTIGATOR:  
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AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 79 \$124,252  
FY 80 \$ 80,929

#### OBJECTIVE:

To test the reliability and validity of the Abbreviated Injury Scale (AIS) and the Injury Severity Scale (ISS) which are being used to classify patients in terms of the severity of their injuries.

#### SCOPE:

The AIS was developed by expert consensus to examine aspects of automobile safety, while ISS is intended to account for multiple injuries and is a mathematical transformation of AIS scores. Neither has been shown to be applicable to non-vehicular injuries, nor evaluated in terms of the information source used to calculate the score, the level of training of the abstractor, or the agreement between scale values and clinical judgments. This study will determine the reliability of scores calculated by physicians, nurses, emergency medical technicians, and research assistants. It will explore differences when scores are calculated from Emergency Department forms, hospital charts, or discharge diagnoses, and when records from different hospitals are used. It will also assess whether scores calculated for non-vehicular injuries are as reliable as for vehicular injuries. Agreement between scores and other methods of assessing severity (probability of survival, length of hospital stay and hospital charges) will also be determined.

#### FINDINGS:

To compare and evaluate the effectiveness of Emergency Medical Services systems and components in improving the care of injured patients, it is essential that adequate methods be provided to account for differences in the severity of the injury and the probability of dying. This study will estimate the limits of reliability of the two scales most commonly used for this purpose, and will thereby permit credible evaluations of these Federal activities in Emergency Medical Services which are intended to improve the care of trauma victims and the needs, if any, for continued effort.



TITLE: Analysis and Therapy of  
Life-Threatening Emergencies

GRANT NUMBER:  
5 R18 HS 01833

GRANTEE INSTITUTION: Professional Staff Asso-  
ciation of Los Angeles  
County Harbor-UCLA  
Medical Center

PROJECT PERIOD:  
06/30/76-06/29/81

AUTHORITY: 1205/EMS

PRINCIPAL INVESTIGATOR:  
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(213) 533-2704

FUNDING LEVEL:  
FY 76 \$100,085  
FY 77 \$ 91,091  
FY 78 \$160,543  
FY 79 \$161,768  
FY 80 \$195,277

#### OBJECTIVE:

To continue the development and evaluation of a set of clinical algorithms using branching logic to manage severe medical emergencies, and to test the algorithms by controlled clinical trials.

#### SCOPE:

The investigators have designed an algorithm for treating patients who arrive at an Emergency Department with potentially life-threatening problems. They have tested the algorithm in a controlled prospective study and are examining the differences in mortality, resuscitation time, arterial blood pressure-time deficit, number of hospital and intensive care days, need for ventilatory support, febrile days and resuscitation related complications in patients treated with and without the algorithm. Further studies include prospective, controlled testing of an algorithm for patients in Intensive Care Units, as well as refinement and validation of a severity (predictive) index to estimate survival probabilities.

#### FINDINGS:

Clinical trials conducted over a 30 month period to evaluate the efficacy of the emergency medical services algorithm indicate that (1) patients treated by the algorithm had significantly shorter resuscitation times as well as trends toward fewer resuscitation-related complications; (2) physicians can and will use an algorithm for emergency medical service resuscitation; (3) in a university hospital with a large emergency service and a commitment to emergency care, the physicians using the algorithm performed as well as, and in some instances better than, those not using the algorithms, and (4) the use of the algorithm prevents delays in resuscitation and may lead to less morbidity and mortality. The investigators conclude that the algorithm helps to organize emergency care, establish standards, and improve care.



PUBLICATIONS AND PRESENTATIONS:

Bland, R., W.C. Shoemaker and M.M. Shabot, "Physiologic Monitoring Goals for the Critically Ill Patient." Surg. Gynecol. Obstet. 147, 833 (1978).

Czer, L.S.C. and W.C. Shoemaker, "Myocardial Performance in Critically Ill Patients: Response to Whole Blood Transfusions as a Prognostic Measure." Crit. Care Med. (in press).

Czer, L.S.C. and W.C. Shoemaker, "Optimal Hematocrit in Critically Ill Post-operative Patients." Surg. Gynecol. Obstet. 147, 363 (1978).

Frantz, R.A., S. Schwartz and W.C. Shoemaker, "Sequential Hemodynamic and Oxygen Transport Responses in Hypovolemia, Anemia, and Hypoxia." Amer.J. Physiol. (in press).

Hopkins, J.A., W.C. Shoemaker, P.C. Chang, S. Greenfield and P. Umof, "Comparison of the Treatment of Surgical Emergencies with and without an Algorithm." Arch. Surg. 115, 745 (1980).

Pierchala, C., W.C. Shoemaker and P. Chang, "A Comparison of some Methods for Early Classification of Survivors and Nonsurvivors of Post-operative Shock." Comput. Biol. Med. 8, 279 (1978).

Shoemaker, W.C., "Pathophysiology, Monitoring and Therapy of Shock." In SCCM's Critical Care: State of the Art (SCCM, Anaheim, California, 1980).

Shoemaker, W.C., "Retrospective and Prospective Studies of a Computerized Algorithm for Predictive Outcome in Acute Post-operative Circulatory Failure." First Annual International Symposium on Computers in Critical Care and Pulmonary Medicine (Plenum Press, New York, New York, 1980).

Shoemaker, W.C., P. Chang, R. Bland, L. Czer, M.M. Shabot and D. State, "Cardiorespiratory Monitoring in Post-operative Patients: I. Prediction of Outcome and Severity of Illness." Crit. Care Med. 7, 237 (1979).

Shoemaker, W.C., P. Chang, R. Bland, L. Czer and M.M. Shabot, "Cardiorespiratory Monitoring in Post-operative Patients: II. Quantitative Indices as Guides to Therapy." Crit. Care Med. 7, 243 (1979).

Shoemaker, W.C. and L.S.C. Czer, "Evaluation of the Biological Importance of Various Hemodynamic and Oxygen Transport Variables." Crit. Care Med. 7, 424 (1979).

Shoemaker, W.C., J.A. Hopkins, P.C. Chang, T. McAuliffe, S. Greenfield, M.M. Shabot and D. State, "Use of Algorithms in Emergencies." EMS Systems Research Methodologies Workshop II, National Center for Health Services Research, 1979.

Shoemaker - HS 01833

Shoemaker, W.C., J.A. Hopkins, S. Greenfield, P.C. Chang, P. Umof, M.M. Shabot, C.W. Spenler and D. State, "Resuscitation Algorithm for Management of Acute Emergencies." JACEP 7, 361 (1978).

Waxman, K., S. Lazrove and W.C. Shoemaker, "Physiologic Responses to Operation in High Risk Surgical Patients." Surg. Gynecol. Obstet. (in press).

TITLE: Clinical Outcomes in EMS Systems  
Feasibility Study

GRANT NUMBER:  
1 RO3 HS 04164

GRANTEE INSTITUTION: University of  
Pittsburgh

PROJECT PERIOD:  
08/01/80-05/31/81

PRINCIPAL INVESTIGATOR:  
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AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 80 \$ 51,800

#### OBJECTIVE:

To conduct a pilot study to determine the feasibility of comparing the effectiveness of emergency medical care delivered in fully-developed Emergency Medical Services systems with systems which are not yet complete.

#### SCOPE:

This is the first step in an effort to design a credible study of various Emergency Medical Services (EMS) systems to determine the extent to which organized systems improve patient care. EMS systems throughout the country are at different stages of development, and there are differences in the ways in which various communities establish, operate, and evaluate their systems. This project will produce reliable criteria or indicators for classifying the stages of development of EMS systems so that equivalent sites can be selected for comparison. It will also determine the availability of patient and operational data in systems at different stages to permit comparisons of clinical effectiveness. The study is a descriptive effort with an emphasis on assessing the feasibility of techniques and procedures for systematic data collection, including field studies in two sites.

#### FINDINGS:

Results of this pilot effort will be used to determine whether EMS systems can yet be described and evaluated with enough rigor to support properly designed comparisons of their clinical effectiveness.

TITLE: Quality of Care in Acute  
Myocardial Infarction

GRANT NUMBER:  
1 RO1 HS 03239

GRANTEE INSTITUTION: McMaster University  
Medical Center

PROJECT PERIOD:  
02/01/79-01/31/82

PRINCIPAL INVESTIGATOR:  
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AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 79 \$121,661  
FY 80 \$104,919  
FY 81 \$102,960

#### OBJECTIVE:

To develop methods and a strategy for validating the medical care process in myocardial infarction against both clinical and functional health outcomes.

#### SCOPE:

This prospective analytic survey is following patients with acute myocardial infarction (rigorously defined) during the course of their care and for six months following discharge. Data on eight characteristics of the care process is gathered from the medical record and from interviews with the patient, the physician, and the family, validated against direct observation of a subsample of patient-M.D. encounters. Pretest interviews are conducted to eliminate bias in the questionnaires, such as memory decay and reactivity. Outcomes include not only survival, but occupational regimen, aspects of health behavior and clinical conditions such as pain and hypertension.

#### FINDINGS:

The project will identify those steps in cardiac care which are sufficiently associated with clinical outcomes to warrant controlled clinical trials in later studies. It will thus demonstrate a general strategy for distinguishing elements of the care process suitable for controlled trials from those which are not. Of specific importance to EMS research is the methodologic work, which will produce efficient tools for gathering valid data on the medical care process, one of the most difficult problems in EMS research. These tools will also help in measuring and controlling variables of the in-hospital and post-hospital sequences of cardiac care. As a result, it will be possible to measure the effect of the EMS system upon ultimate survival and degree of recovery. Such research is now hampered by inability to control for variations in the care after the emergency phase.



TITLE: Adequacy and Validity of Data  
About Acute Poisonings

GRANT NUMBER:  
1 R03 HS 03994

GRANTEE INSTITUTION: University of Utah

PROJECT PERIOD:  
02/01/80-01/31/81

PRINCIPAL INVESTIGATOR:  
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AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 80 \$ 50,719

#### OBJECTIVE:

To investigate the magnitude of the poisoning problem in Utah, assess the kinds of data that can be reliably obtained from sources other than the Poison Control Center, and explore the relationship between data gathered by the Intermountain Regional Poison Control Center (IRPCC) and the statewide poison emergency problem.

#### SCOPE:

For a period of six months poison data will be collected from physicians, hospitals, a general population survey, and the IRPCC. The information will be examined to describe the extent to which data available from these different sources can be used to estimate the incidence of poisonings in Utah, to describe the ways in which health care facilities are used for poisoning cases, and to investigate whether certain types of poisonings can serve as "tracer" conditions, a technique used by evaluators in the other critical care areas. The primary purpose of the study is to assess rates and proportions, not to compare groups.

#### FINDINGS:

It is believed that regional Poison Control Centers properly integrated into an organized Emergency Medical Services System (EMSS) can reduce mortality and morbidity. However, no evaluations have been done concerning the extent to which these Centers are effective in reducing mortality and morbidity and little is known about the magnitude and severity of poisoning problems in the general population. The diversity of data sources makes it difficult to determine the types, quantity, availability and reliability of the data and how they might be used to evaluate programs. This study will compare techniques for obtaining data and the usefulness of the different kinds of data for evaluation purposes. It will lay the foundation for studies designed to measure the impact of new poison control services such as the demonstration program authorized under the 1979 Amendments to the EMSS Act.



TITLE: The Effectiveness of Mobile  
Intensive Care

GRANT NUMBER:  
1 RO3 HS 04356

GRANTEE INSTITUTION: Duke University  
Medical Center

PROJECT PERIOD:  
09/30/80-09/29/82

PRINCIPAL INVESTIGATOR:  
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AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 80 \$ 24,771

#### OBJECTIVE:

To replicate the King County, Washington, studies of effectiveness in prehospital cardiac care of Advanced Life Support (ALS) services.

#### SCOPE:

This is a prospective study which began several years ago with planning for Advanced Life Support (ALS) services in Durham County, North Carolina. Baseline data have been collected on about a thousand patients over a 16-month period, detailing characteristics of the patient and the care process until discharge or death. Following institution of ALS, data collection will continue for the two-year period of the grant, and outcomes before and after ALS became available will be compared.

#### FINDINGS:

This study has the advantage of not being in the Seattle area; there have been suggestions that the findings of the King County studies (especially Bergner, HS 02456) were principally owing to the unique setting. If ALS is again shown to improve survival chances of victims of cardiac arrest, the level of confidence in that earlier evidence will be greatly increased. In addition, data on the course of the patient after arrival at the hospital may offer an understanding of morbidity as well as mortality effects.

TITLE: A Computerized Evaluation Model  
for EMS Performance

GRANT NUMBER:  
5 R18 HS 02902

GRANTEE INSTITUTION: University of  
Pennsylvania

PROJECT PERIOD:  
09/01/77-02/28/80

PRINCIPAL INVESTIGATOR:  
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AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 77 \$255,000  
FY 78 \$270,000

#### OBJECTIVE:

To develop an effective and economically feasible method for using ongoing data collection systems to monitor the performance of prehospital care in an EMS system, to provide feedback information to providers based on the evaluation, and to assess the effect of this feedback on changes in performance.

#### SCOPE:

Building on a uniform data collection system used by 150 ambulance companies providing 175,000 trips per year in and around Pittsburgh, a computerized screening model was developed to identify cases in which EMTs deviated from normal care patterns, according to care protocols developed and validated by panels of physicians.

#### FINDINGS:

This system provides communities with an efficient method for using uniform data collection systems to audit EMT performance and assure that care provided meets established standards. It was also the basis for developing an experimental model for use by a region in planning training, refresher training, and recertification programs. It is currently being implemented by several ambulance company medical directors as an efficient method of prehospital case review.

Wolfe - HS 02902

PUBLICATION:

Wolfe, H., L. Shuman, P. McAllister and S. Edelstein, "Computer Evaluation of Paramedic Training Programs." Emergency Medical Services (September 1978).

TITLE: Computerized Prehospital Skill  
Deployment/Maintenance

GRANT NUMBER:  
1 RO1 HS 03813

GRANTEE INSTITUTION: University of  
Pittsburgh

PROJECT PERIOD:  
09/01/79-08/31/81

PRINCIPAL INVESTIGATOR:  
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AUTHORITY: 1205/EMS

FUNDING LEVEL:  
FY 79 \$222,000  
FY 80 \$248,514

#### OBJECTIVE:

To develop a methodology and associated model that can be utilized in planning and monitoring the manpower skill requirements of the prehospital phase of an Emergency Medical Services (EMS) system.

#### SCOPE:

This project uses the prehospital care algorithms and data collection systems already in place to develop and test a model of required prehospital care skills based on prehospital care demand as a function of population characteristics of the region. Performance monitoring will determine the extent to which the skill requirements are met by the EMTs in the field. An experimental program of continuing education will be designed, specifically targeted toward the performance deficiencies and skill decays which were identified. The program will be tested using paramedics randomly assigned to either an experimental group or a control group who will receive traditional, untargeted continuing education. The results of these activities will be used to develop a regional model of paramedic training requirements based upon population characteristics.

#### FINDINGS:

The expected product is a method whereby an EMS system can determine precisely how much and what kind of continuing education and training of paramedics is required for effective prehospital care. Since large sums of money are being spent annually for the training and continuing education of prehospital care personnel, the potential of this model to increase the efficiency of such expenditures is very significant. It will allow administrators to make immediate training decisions, and also to anticipate the effects upon long-term resource requirements of changes in the system or the population served.





ACTIVE EMS-RELATED RESEARCH PROJECTS: 305

OCTOBER 1979 - MARCH 31, 1981



TITLE: Socialization: EMS and Other  
Residency Programs

GRANT NUMBER:  
5 R01 HS 02129

GRANTEE INSTITUTION: Medical College of  
Pennsylvania

PROJECT PERIOD:  
06/30/76-12/31/80

PRINCIPAL INVESTIGATOR:  
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Emergency Medicine Section  
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AUTHORITY: 305

FUNDING LEVEL:  
FY 76 \$109,464  
FY 77 \$121,242  
FY 78 \$152,624  
FY 79 \$130,577

#### OBJECTIVE:

To study physicians during their emergency medicine residency training to determine what characterizes and differentiates the process of professional socialization among emergency medicine residents compared to physicians in other residencies. To study career patterns of graduates of emergency medicine residencies to determine extent of commitment to specialty, clinical and academic orientation, job satisfaction, and content.

#### SCOPE:

A national sample of emergency medicine residents is being compared with internal medicine and surgery residents. A panel design is being utilized to investigate career decisions. The design provides reliability in testing hypotheses about differences within and between the specialties with respect to career expectations, commitment, professional identity, acquiring professional skills and attaining medical judgment. Graduates from emergency medicine programs between 1972 and 1979 are also being surveyed.

#### FINDINGS:

Data analysis is now underway. Findings are expected to have policy implications for: (1) staffing and management of emergency departments; (2) development of residency programs and teachers in the field of emergency medicine; and (3) ways in which resident selection, the process of graduate medical education, and organizational variables interact to influence career outcomes.

PUBLICATIONS AND PRESENTATIONS:

Anwar, R.A.H., "Career Characteristics of Residency Trained Emergency Physicians." Emergency Health Services Quarterly 1, No. 1 (Fall 1980).

Anwar, R.A.H., "Current Status of Emergency Medical Services - Emergency Department Staffing Patterns." Presented at the American Association for the Surgery of Trauma, Chicago, Illinois (September 13-15, 1979) and American Journal of Trauma (forthcoming).

Anwar, R.A.H., "Emergency Medical Services and Residency Training." Presentation at the Brooke Army Medical Center, Houston, Texas (October 23-24, 1979).

Anwar, R.A.H., "Residency Trained Emergency Physicians: Where Have All The Flowers Gone?" Presented to the University Association of Emergency Medicine, San Francisco, California (May 1979) and Journal of the American College of Emergency Physicians 8, No. 2, 84-87 (February 1979).

Anwar, R.A.H., "Skills and Procedures in Emergency Medicine: Room for Controversy." Presented to the American College of Emergency Physicians, San Francisco, California (November 1977) and Journal of the American College of Emergency Physicians 7, No. 5, 198-201 (May 1979).

Anwar, R.A.H., "The Training Environment and the Process of Resident Evaluation in Surgery." Presented to the Association for Academic Surgery (November 1978) and J. Surg. Res. (forthcoming).

Anwar, R.A.H., "Trends in Training: Focus on Emergency Medicine." Special Presentation, University Association of Emergency Medicine, Orlando, Florida (May 1979) and Annals of Emergency Medicine 9, No. 2, 60-71 (February 80).

Anwar, R.A.H., D.E. Kurz, A. Gioe and D.K. Wagner, "Variables Influencing the Development of Emergency Medicine Residency Programs: An Evaluative Process for Graduate Medical Education." Presented at the UA/EM Annual Conference, Kansas City, Missouri (May 1977).

Kurz, D.E., R.A.H. Anwar and A. Gioe, "Professionalization and Medical Specialties: A Theoretical View." Presented at the Eastern Sociological Association Meeting, New York, New York (March 1977).

TITLE: An X-Ray Screening Protocol for  
Extremity Injuries

GRANT NUMBER:  
1 R03 HS 03625

GRANTEE INSTITUTION: Yale University

PROJECT PERIOD:  
02/01/79-09/30/80

PRINCIPAL INVESTIGATOR:  
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AUTHORITY: 305

FUNDING LEVEL:  
FY 79 \$55,925

#### OBJECTIVE:

To develop and test a method for reducing unnecessary x-ray films in the care of extremity injuries in Emergency Departments.

#### SCOPE:

Patients with upper and lower extremity injuries are being studied prospectively. Data have been gathered on patient characteristics and clinical manifestations, such as "swelling" and "limitation of motion," to identify the features which best indicate the presence of fracture, as determined by x-ray. The resulting model has been used to construct a protocol for use in judging the need for x-ray films. The protocol has been designed to reduce the number of x-rays without increasing the number of "missed" fractures beyond the status quo. Patients which the protocol identifies as low-risk are not x-rayed, but are followed up by telephone to disclose any indication that a fracture may have been missed and further examination is required.

#### FINDINGS:

An x-ray screening protocol has been developed which can reduce by 20% the number of diagnostic x-rays of the extremities. The protocol is based on an analysis of data collected prospectively from 325 upper extremity and 470 lower extremity injured patients. The upper extremity protocol has been tested on a new series of 550 patients, for whom it has served as a guideline for determining the need for x-ray evaluation. This protocol was able to identify all significant fractures and dislocations. A lower extremity protocol is currently being tested in a similar experiment to determine its potential impact on x-ray utilization, cost, and quality of care. The method of this study can be used for x-rays of other types of injuries and may also be applied to other diagnostic procedures.



Brand - HS 03625

PUBLICATIONS AND PRESENTATIONS:

Brand, D.A., W.H. Frazier, M.J. Pais, T. Light and K. Shea, "Emergency Room Extremity Radiography." Presented at the Annual Meeting of the American Public Health Association (November 4-8, 1979).

Brand, D.A., M.J. Pais, W.H. Frazier and K. Shea, "An X-ray Screening Protocol for Extremity Injuries." Presented at the Annual Meeting of the Radiological Society of North America (November 26-30, 1979).

TITLE: A Computer Audit to Improve  
ER Drug Prescribing

GRANT NUMBER:  
1 R03 HS 03953

GRANTEE INSTITUTION: Yale University

PROJECT PERIOD:  
09/01/79-08/31/80

PRINCIPAL INVESTIGATOR:

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(203) 436-3628

AUTHORITY: 305

FUNDING LEVEL:  
FY 79 \$ 54,250

#### OBJECTIVE:

To measure the effectiveness of a computer-assisted medical audit in improving the ways in which drugs are prescribed in Emergency Rooms. The randomized controlled study will also determine (1) if improvements in prescriber behavior continue beyond the period of audit, and (2) the relative effectiveness of the audit as a function of the delay between the particular episode of patient care and the providers' receipt of the case audit report.

#### SCOPE:

The performance of physicians treating soft tissue injuries in three hospital emergency departments is being reviewed during a one-year period. In one of those hospitals, a randomly assigned control group is maintained. A computer-assisted audit comparing problem-specific medical records to a previously developed clinical algorithm is being conducted. Providers will receive daily case audit reports indicating instances of deviation from standard prescribing practices, and will be asked to give reasons for the deviations. The deviation rates will be used as the measure of improvement in drug prescribing and will be calculated before, during, and after the system has had a chance to influence physician behavior. Different feedback delays and hospital size, affiliations, and staffing patterns will be correlated with deviation rates.

#### FINDINGS:

The system as proposed has clear relationships to issues of cost containment, as well as problems in quality assurance, medical education and drug prescribing practices. The approach can be applied to other clinical areas, both surgical and non-surgical. Since the computer-based system can be implemented through ordinary telephone lines, it would be useful for any institution desiring to monitor the care of its patients and provide continuing education to its physicians. Preliminary findings have demonstrated significant changes in prescribing practices (use of antibiotics and tetanus toxoid) at two of the three hospitals. The remaining hospital, which has the smallest case volume of the three, may exhibit similar changes as a larger number of cases is collected.

TITLE: Evaluation of Emergency Room  
Referral System

GRANT NUMBER:  
1 R03 HS 04005

GRANTEE INSTITUTION: Sinai Hospital of  
Baltimore, Inc.

PROJECT PERIOD:  
09/30/79-09/29/80

PRINCIPAL INVESTIGATOR:  
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AUTHORITY: 305

FUNDING LEVEL:  
FY 79 \$ 46,783

#### OBJECTIVE:

To identify the demographic, medical, attitudinal and other factors which improve the chances of successful referral of patients from an emergency room to a source of continuous and comprehensive primary medical care.

#### SCOPE:

Using both retrospective and prospective record reviews as well as interviews with patients, the investigators are examining differences between those patients who comply with recommendations to seek primary care at an appropriate facility and those who do not comply with such recommendations. Comparisons between these groups include previous experience with medical care facilities, insurance status, socio-demographic data and urgency of symptoms. The effectiveness of different ways of making referrals will be examined, and reasons for failure to keep appointments will be explored.

#### FINDINGS:

Care of non-urgent conditions in an emergency department rather than a primary care setting results in higher charges to patients and also in episodic, rather than continuous care, such that preventive care may not receive proper emphasis. Attempts to refer patients to appropriate primary care centers have not been notably successful, however. Through learning more about the medical condition of patients who do not comply with referral recommendations, and determining which types of referral efforts are successful, it will be possible to ensure that these patients receive more appropriate and more economical care. The research findings will be important in primary care center staffing, patient education programs, and preventive medicine efforts. Current findings suggest that it will be possible to develop guidelines to improve appropriateness and effectiveness of referral.

TITLE: Validation of Quality Assessment  
Measures in EMS

GRANT NUMBER:  
3 R01 HS 02149

GRANTEE INSTITUTION: Yale University

PROJECT PERIOD:  
06/01/76-04/30/81

PRINCIPAL INVESTIGATOR:  
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AUTHORITY: 305

FUNDING LEVEL:  
FY 76 \$230,850  
FY 77 \$236,709  
FY 78 \$155,617  
FY 79 \$ 95,481  
FY 80 \$174,288

#### OBJECTIVE:

To examine the process of care in the Emergency Department, with the aim of developing and testing a quality assurance system.

#### SCOPE:

Clinical algorithms, or detailed medical treatment guidelines incorporating branching logic, have been developed for several different conditions. In the case of soft-tissue lacerations, institution of a check-list calling for entry of all data required by the algorithm before audit dramatically increased the auditable cases (i.e., those with adequate information to trace the process of care). The algorithms for several additional conditions are being tested in a similar way; effects of rapid feedback to individual physicians based upon compliance with algorithms is being studied; and the usefulness of this quality assessment method in other hospitals is being tested. Similar experiments will be carried out on burns, soft-tissue infections, and upper- and lower-extremity injuries. Ultimately tested algorithms will be available to manage about 50% of the cases seen in an Emergency Department.

#### FINDINGS:

Very little research has yet been done on the adequacy of care in an emergency facility. Explicit standards for this care, as represented by these algorithms, permit audit of medical decisions made and actions taken, and avoid unnecessary tests or procedures (which represent increased cost as well as risk to the patient). Preliminary results indicate a substantial improvement in physician performance from the use of algorithms with feedback. That much of this improvement remains even when feedback is discontinued suggests that there is a learning effect.

Frazier - HS 02149

PUBLICATIONS AND PRESENTATIONS:

Brand, D.A. and W.H. Frazier, "The Impact of Computer-Assisted Audit on Physician Performance in an Emergency Service," in Evaluation of Medical Action, North-Holland Publishing Company, 1979.

Brand, D.A., W.H. Frazier, K.E. Glancy and D.H. Freeman, "Physician Education Through Computer Surveillance and Feedback." Proceedings of the Fourth Annual Symposium on Computer Applications in Medical Care, IEEE, November 1980.

Frazier, W.H. and D.A. Brand, "Emergency Department Trauma Care: Priorities and Documentation." Surgical Clinics of North America, 60, 5, 1009-1020.



TITLE: Assessing Emergency Systems  
Quality: Method Development

GRANT NUMBER:  
2 R18 HS 02467

GRANTEE INSTITUTION: Regents of the  
University of  
California, Los Angeles

PROJECT PERIOD:  
06/30/76-12/31/81

AUTHORITY: 305

PRINCIPAL INVESTIGATOR:  
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Center for Health Sciences  
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FUNDING LEVEL:  
FY 76 \$131,924  
FY 77 \$156,480  
FY 78 \$ 33,083  
FY 79 \$203,792  
FY 80 \$235,431  
FY 81 \$230,392

#### OBJECTIVE:

To compare criteria mapping (CM) as a method of quality assessment in the Emergency Department (ED) with the explicit criteria list method used by Professional Standards Review Organizations. CM utilizes a branching logic format to generate patient-specific criteria to judge the care for any given subgroup of patients, based on estimation of the risk of serious disease.

#### SCOPE:

The existing chest pain CM study is being expanded to two new EDs to test generalizability of the CM methodology in other settings. At each new hospital ED, a panel of physicians is reviewing and modifying, if necessary, the original chest pain CM. Data are being abstracted from the patient records using both the original CM and modified CMs to compare their validity in terms of patient outcomes. The results of this portion of the study will be used to develop a chest pain CM training package for medical record abstractors that can be used in any ED to implement the CM method of quality assessment. In addition to extending the chest pain study to two new EDs, an abdominal pain CM is being developed. After testing the abdominal pain CM in the two hospitals where it is developed, its exportability will be tested by extending its use to two new EDs in the same manner as with the chest pain CM.

#### FINDINGS:

Results thus far show that the CM method can predict the outcome for chest pain patients and signal deficient care by identifying those patients for whom specific action should have been taken but was not. The final product will be a set of educational materials designed to train medical record abstractors in the use of CMs. This will enable any ED to implement the CM method to assess quality of care for patients presenting with chest pain or abdominal pain. This research is relevant to NCHSR's mandate to improve the quality of emergency care and develop cost-effective methods of assessing the quality of health care.

PUBLICATIONS AND PRESENTATIONS:

Cretin, S., S. Greenfield and L.G. Worthman, "Criteria Mapping in Assessing the Quality of Care for Patients with Chest Pain." Presentation at the Annual Meeting of the University Association for Emergency Medicine in Tucson, Arizona (April 1980).

Greenfield, S., S. Cretin, L.G. Worthman, F. Dorey, N.E. Solomon and G.A. Goldberg, "Comparison of a Criteria Map to a Criteria List in Quality of Care Assessment: The Relation of Each to Outcome." Medical Care (In press).

Greenfield, S., L.G. Worthman and S. Cretin, "Quality Assessment by the Criteria Mapping Method." In Topics in Medical Records Management, C.E. Elsey, Ed. (Aspen Systems Corporation, Germantown, Maryland, forthcoming in Fall 1980).

Linn, L.S., J.E. Ware, Jr. and S. Greenfield, "Factors Associated with Relief from Chest Pain Following Emergency Care." Medical Care 18, No. 6, 624-634 (June 1980).

Worthman, L.G., S. Greenfield and S. Cretin, "Quality Assessment in Emergency Medical Systems: The Criteria Mapping Method." Emergency Medical Services 8, No. 6, 94-97 (November/December 1979).

TITLE: Cost-Effective Strategies in  
Ambulatory Care

GRANT NUMBER:  
7 R01 HS 04066

GRANTEE INSTITUTION: Peter Bent Brigham  
Hospital

PROJECT PERIOD:  
03/01/76-06/30/81

PRINCIPAL INVESTIGATOR:  
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Boston, Massachusetts 02115  
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AUTHORITY: 305

FUNDING LEVEL:  
FY 76 \$225,807  
FY 77 \$231,309  
FY 78 \$192,733  
FY 79 \$224,144

OBJECTIVE:

To design cost-effective strategies for common clinical conditions in ambulatory care and emergency room settings using conditional probabilities.

SCOPE:

Techniques of decision analysis are used to determine the most efficient methods for gathering clinical data and providing timely and proper treatment. Using data from the National Ambulatory Medical Care Survey, approximately 15 prevalent ambulatory conditions have been selected for investigation. For each problem a decision tree is being designed which will identify the commonly employed diagnostic and therapeutic strategies. For each strategy, the investigators will identify the principal subgroups of patients for whom the strategies might differ.

FINDINGS:

The product of this effort will be a set of explicit decision strategies to guide the provider in selection of the treatment of some urgent and non-urgent conditions frequently seen in emergency and outpatient facilities, and the identification of critical data gaps and research required to develop decision strategies for other conditions.

PUBLICATIONS AND PRESENTATIONS:

Aronson, M.D., A.L. Komaroff, T.M. Pass and C.T. Ervin, "Infectious Mononucleosis in Patients Presenting with Sore Throat." Clin. Res. 27, 119A (1979).

Berwick, D.M., A.L. Komaroff and H. Sherman, "Cost-effectiveness of Lead Screening." Clin. Res. 28, 291A (1980).

Ervin, C., A.L. Komaroff and T.M. Pass, "Behavioral Factors and Urinary Tract Infection." Letter to editor, JAMA 243, 330-331 (1980).

Gerber, S.D., B.S. Levy, P. Come and A.L. Komaroff, "A Diagnostic Strategy for Myocardial Infarction." J. Fam. Pract. 9, 207-218 (1979).

Komaroff, A.L., "Can the Art of Primary Medical Care be Made a Science?" Presented at the University of Massachusetts Medical School, Worcester, Massachusetts (May 1980).

Komaroff, A.L., "Cost-effective Use of Laboratory Tests." Presented at the University of Minnesota School of Medicine, Minneapolis, Minnesota (June 1980).

Komaroff, A.L., "Cost-effectiveness of Sore Throat Care." Presented at the University of Rochester School of Medicine, Rochester, New York (May 1980).

Komaroff, A.L., "Serologic Evidence of Chlamydial Pneumonitis in Adults." Presented at the American Federation for Clinical Research, Washington, D.C. (May 1980).

Komaroff, A.L., "The Dysuria-pyuria Syndrome." N. Engl. J. Med. (in press).

Komaroff, A.L., "The Etiology of Sore Throat in Adults." Presented at the American Federation for Clinical Research, Washington, D.C. (May 1980).

Komaroff, A.L., "The Variability and Inaccuracy of Medical Data." In IEEE PROCEEDINGS, Technology and Health Care. (The Institute of Electrical and Electronic Engineers, New York, New York, 1979).

Komaroff, A.L., M.D. Aronson and T.M. Pass, "The Etiology of Sore Throat in Adults." Clin. Res. 28, 227A (1980).

Komaroff, A.L., M.D. Aronson, T.M. Pass and C.T. Ervin, "Prevalence of Pharyngeal Gonorrhea in General Medical Patients with Sore Throat: Gonorrhea in Sore Throat." Sex Transm. Dis. (in press).

Komaroff, A.L., M.D. Aronson and J. Schachter, "Serologic Evidence of Chlamydial Pneumonitis in Adults." Clin. Res. 28, 227A (1980).

Komaroff, A.L., T.M. Pass, J.D. McCue, A.B. Cohen, T.M. Hendricks and G. Friedland, "Management Strategies for Symptoms of Urinary and Vaginal Infections." Arch. Intern. Med. 218, 1069-1073 (1978).



McCue, J.D., A.L. Komaroff, T.M. Pass, A.B. Cohen and G. Friedland, "Strategies for Diagnosing Vaginitis." J. Fam. Pract. 9, 395-402 (1979).

Pass, T.M., A.L. Komaroff, C. Ervin and P. Soodalter, "Reliability of Chest X-ray for Diagnosing Pneumonia in Ambulatory Patients." Clin. Res. 27, 282A (1979).

Pass, T.M., A. L. Komaroff and H. Sherman, "Computerized Data Bases and Cost-effective Test Ordering." In Proceedings, Eighth Annual Conference of the Society for Computer Medicine, Minneapolis, Minnesota, 1978.

Pass, T.M., A.L. Komaroff and H. Sherman, "Decision Trees and Logic Trees." In Proceedings of the Thirteenth Hawaii International Conference on System Sciences: Selected Papers in Medical Information Processing, B. Shriver and R.H. Sprague, Eds. (Western Periodicals Company, North Hollywood, California, 1980).

Stern, R.S., T.M. Pass and A.L. Komaroff, "Care of Acne: A Cost-effectiveness Analysis." Clin. Res. 28, 300A (1980).

Taylor, W.C., T.M. Pass and A.L. Komaroff, "Applying the Results of Cholesterol-lowering Trials to the Framingham Study Population." Clin. Res. 28, 301A (1980).

Woo, B., P. Jen, P.E. Rosenthal, H.F. Bunn and L. Goldman, "The Evaluation of Anemic Inpatients: Correlates of House Officer Performance." Arch. Intern. Med. (in press).



TITLE: Severity Index Construction:  
Methods, EMS Application

GRANT NUMBER:  
1 R18 HS 03090

GRANTEE INSTITUTION: University of Florida

PROJECT PERIOD:  
02/01/79-04/30/82

PRINCIPAL INVESTIGATOR:

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AUTHORITY: 305

FUNDING LEVEL:

FY 79 \$114,277  
FY 80 \$104,320  
FY 81 \$ 97,429

OBJECTIVE:

To develop analytic methods for the construction of severity indices which are consistent with clinical judgments. Such indices will be useful in evaluating the adequacy, timeliness, and impact of emergency medical services.

SCOPE:

To develop and test indices of the severity of burns and trauma, and of the need for care, the investigators will use decision theory, utility theory and modeling of clinicians' judgments. Constructing the indices includes: defining attributes to be included in each index; testing the assumptions of the independence of attributes; assessing the relative weights of the attributes; assessing severity functions of each attribute; and modeling by combining all attributes and severity functions into a single index. These indexes will then be tested against actual clinical data from the Florida Trauma Registry.

FINDINGS:

The expected findings are better methods to construct and test severity indices, together with several improved indices of severity and immediacy of need for care relating to trauma and burns. Such work is pertinent to legislation addressing Emergency Medical Services and the evaluation of such nationwide efforts.

PUBLICATIONS AND PRESENTATIONS:

Bingham, H.G., J.P. Krischer, J.J. Shuster and I.A. Engelmann, "Effect of Nutrition on Length of Stay and Survival for Burned Patients." Submitted to Burns.

Krischer, J.P., "An Annotated Bibliography of Decision Analytic Applications to Health Care." Operations Research 28, 97-113 (1980).

Krischer, J.P., J.J. Shuster, H.G. Bingham and R. Melker, "A Testing of Principles for Severity Index Construction with Application to Burn Injuries." Presented at the University Association for Emergency Medicine Annual Meeting in Tucson, Arizona (April 1980).

Shuster, J.J. and J.P. Krischer, "Optimal Ordinal Severity Indexes." Submitted to the Journal of the American Statistical Association.

TITLE: Applications of Decision Theory  
to the Triage Process

GRANT NUMBER:  
1 RO3 HS 03626

GRANTEE INSTITUTION: Georgetown University

PROJECT PERIOD:  
02/01/79-06/30/80

PRINCIPAL INVESTIGATOR:  
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AUTHORITY: 305

FUNDING LEVEL:  
FY 79 \$ 47,664  
FY 80 \$ 4,949

#### OBJECTIVE:

To explore the applicability of decision theory to the process of developing triage protocols and to define future research and data collection requirements for Emergency Medical Services (EMS) systems.

#### SCOPE:

The project is developing an algorithmic decision theory model for use in the prehospital sorting of acute trauma and burn patients. Clinical and operations research literature are used to estimate parameters for the mathematical model. Scenarios involving different time-to-treatment combinations and different survival curves are being developed. Clinical and logistical factors will be merged in the decision node of the triage process. In addition the study will determine the amount and precision of clinical data, and the level of precision in survival curves, necessary to support the triage process. Results will be tested and analyzed on the basis of hypothetical data. The final report will include the design of a follow-up study which can test the model against data from operational EMS systems.

#### FINDINGS:

Federal policy in EMS development centers upon determining the appropriate EMS facility to provide the level of care required, and categorizing such facilities on a regional basis in order to provide effective and efficient care. Critical to such a scheme is the ability to classify patients according to the clinical nature and severity of their conditions. When fully developed, the methodology will provide analytic tools for use by regional health planning authorities, a quality control technique for the analysis of prehospital triage procedures, and improved input to EMS Technician and Dispatcher Training programs, as well as enhancing the emergency patient's probability of survival.

PUBLICATIONS AND PRESENTATIONS:

Landau, T.P., "Decision Theory Model of the Emergency Medical Triage Process." Presented to the Joint National Meeting of the Operations Research Society of America and the Institute of Management Sciences, Milwaukee, Wisconsin (October 1979).

Landau, T.P., R.S. Ledley, H.R. Champion and W.J. Sacco, "An Application of Decision Theory to the Emergency Medical Triage Process." Presented to the Annual Meeting of the University Association for Emergency Medicine in Tucson, Arizona (April 1980).

Landau, T.P., R.S. Ledley, H.R. Champion and W.J. Sacco, "Decision Theory Model of the Emergency Medical Triage Process." Presented to the 108th Annual Meeting of the American Public Health Association, Injury Control and Emergency Health Services Section, Detroit, Michigan (October 1980).

Ledley, R.S., T.P. Landau, W.J. Sacco and H.R. Champion, "Interactive Decision Support System for the Emergency Medical Triage Process." Published in the Proceedings of the Third Annual Symposium on Computer Applications in Medical Care, 52-56 (Institute of Electrical and Electronics Engineers Computer Society, Washington, D.C.).

TITLE: Measuring the Quality of  
Survival in Burn Patients

GRANT NUMBER:  
1 R18 HS 03237

GRANTEE INSTITUTION: Baltimore City  
Hospitals

PROJECT PERIOD:  
02/01/79-09/30/80

PRINCIPAL INVESTIGATOR:  
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AUTHORITY: 305

FUNDING LEVEL:  
FY 79 \$ 43,823

#### OBJECTIVE:

To develop a reliable and valid burn outcome scale based upon quality of life in survivors of burn injuries. Over 80 percent of hospitalized burn victims survive, so that survival alone appears to be inadequate to compare the outcomes of care or the effectiveness of burn centers. The new scale will make it possible to compare the outcomes of patients in different burn centers or in burn centers versus general hospitals at one point in time, and longitudinally across time.

#### SCOPE:

The scale will select burn-relevant questions on level of recovery (disability, pain, etc.) from existing scales, and add burn-specific questions developed by local patients and a consultant group. A small group of patients (about 30), discharged 1 to 3 months previously, will be monitored to yield pilot data for a subsequent major longitudinal effort.

#### FINDINGS:

A composite questionnaire of 389 health related items was developed. This questionnaire was made up of the short form of the Sickness Impact Profile, the scale of Activities of Daily Living, and the General Index of Well Being as well as 180 items specific to the problems of burn patients. A group of consultants including professionals and patients rated the relevance of each of these items on an 11 point scale and the results were statistically analyzed. The top rated items, where there was no statistically significant difference in the opinion regarding relevance between any of the groups of consultants polled, were selected for a final burn specific scale. These items are currently being collected into content areas and prepared for field testing. It would appear from our findings to date that thermal injury does indeed represent an area of health care for which none of the existing indices of health status is adequate, and for which a new outcome scale will be necessary for accurate and sensitive measurements.



PUBLICATIONS AND PRESENTATIONS:

Blades, B.C., C. Jones and A.M. Munster, "Quality of Life after Major Burns." The Journal of Trauma 19, 556 (August 1979).

Munster, A.M., B.C. Blades, J. Mamon and A. Kaszuba, "Development of an Outcome Scale for Burns: Methods, Problems, and Prospects." Harvard, M.I.T. (In press).

TITLE: Burn Care Facility Study

GRANT NUMBER:

1 R01 HS 03261

GRANTEE INSTITUTION: Regents of the  
University of Michigan

PROJECT PERIOD:

04/01/79-03/31/81

PRINCIPAL INVESTIGATOR:

Beverly C. Payne, M.D.

AUTHORITY: 305

Health Services Research Center

University of Michigan

FUNDING LEVEL:

220 E. Huron Street, 3rd Floor

FY 79 \$380,315

Ann Arbor, Michigan 48109

FY 80 \$361,769

(313) 763-1202

#### OBJECTIVE:

To develop methods to determine the cost effectiveness of special care facilities for burn patients. Measures of patient characteristics, architectural and organizational factors, quality of care, and costs of treatment are being tested for subsequent incorporation in a full scale examination of patient care in different critical-care units, and in comparisons between specialized facilities and general hospital wards.

#### SCOPE:

The initial project is studying 1,000 patients in ten hospitals, six with specialized burn care facilities and four without. Instruments are being developed to collect data on five major types of variables: 1) patient outcomes; 2) patient prognostic indicators; 3) treatment variables; 4) organizational variables; and 5) costs. Data will be used in methodologic analyses and preliminary exploration of hypothesized relationships in preparation for a larger-scale study.

#### FINDINGS:

The costs of care in specialized facilities is considerably greater than in general hospital beds, and therefore there is an immediate need to determine which factors, if any, are associated with improved patient care before a planned program to establish burn care centers is undertaken. This study will provide tested methods whereby such a determination can be made.

PUBLICATIONS AND PRESENTATIONS:

Harrison, R.V., et al., Presentation on Preliminary Instrument Development and Data from the Burn Care Facility Study, University of Michigan, National Institute for Burn Medicine, to the University Association for Emergency Medicine in Tucson, Arizona (April 20-22, 1980).

TITLE: Community Planning for  
Emergency Medical Services

GRANT NUMBER:  
3 R01 HS 02512

GRANTEE INSTITUTION: University of  
Pittsburgh

PROJECT PERIOD:  
06/30/76-11/30/79

PRINCIPAL INVESTIGATOR:  
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FUNDING LEVEL:  
FY 76 \$208,271  
FY 77 \$200,993  
FY 78 \$166,437  
FY 79 \$ 59,402

#### OBJECTIVE:

To describe in detail emergency care planning and system development in selected communities/regions throughout the U.S.; to identify the conditions which have led to improvement or lack of improvement in the community's ability to provide emergency medical services (EMS); to develop materials for education of health professionals and laymen in health planning and systems development; and to expand conceptual and theoretical knowledge of health planning and systems development.

#### SCOPE:

The investigator has systematically constructed the chronology of events relative to EMS planning in 16 communities or planning areas by means of personal interviews. Significant information has been obtained to identify both formal and informal structures and processes and to suggest relationships of these structures and processes to levels of accomplishment as an outcome. Study communities or planning areas were carefully selected to include examples of areas which appear to have made significant progress and those which do not. Interviews in each community were supplemented by appropriate descriptive and statistical documents (census data, minutes of meetings, planning documents, grant applications, etc.). The process has been described in sufficient detail to permit the research group to develop a computer simulation of the planning effort.

#### FINDINGS:

The study has identified conditions that facilitate or impede the planning process. The emergency medical services system program offered a convenient model for analysis. Training materials for professionals are being developed which will have potential for direct benefits in improving the planning skills of those involved in EMS system development and improvement.

PUBLICATIONS AND PRESENTATIONS:

Dorinson, R., "Community Planning for Emergency Medical Services." Presented to the Pennsylvania Emergency Health Services Council's Emergency I Conference, and Statewide EMS Conference sponsored by the Hospital Association of Pennsylvania, Hershey, Pennsylvania (December 1-3, 1977).

Dorinson, R., "Hospital Involvement in Community Emergency Medical Services Planning and Implementation." Proposed dissertation for D.P.H., Graduate School of Public Health, University of Pittsburgh.

Dorinson, R., "Problems in Providing Health Care in Urban Areas." Lecture presented to Urban Studies Seminar, University of Pittsburgh (April 3, 1978).

Esposito, G., "EMS - A National Perspective and Case Study." Presented at Emergency Medical Services Workshop, Akron, Ohio (February 18, 1978).

Esposito, G., "Long Term Role of EMSS Management Agency." Presented in Boston (November 1976).

Esposito, G., "Role of Foundations in Regional EMS Projects." Delivered to the Association of Foundation Administrators, Pittsburgh, Pennsylvania (February 8, 1978).

Esposito, G., "Sociological and Scientific Evaluation of Impact of Expenditure of EMS Dollars." Seminar to doctoral students in the School of Urban Affairs, Carnegie Mellon University (February 20, 1978).

Gunter, M., "Innovations in Field Research Methodology in the Study of Regional Emergency Medical Services Development." Lecture presented to Research Methods Seminar, Department of Epidemiology, State University of New York at Buffalo (April 1978).

Hershey, N. and M.J. Bowes, "Comparative Review of State Law Relevant to the Organization of Emergency Medical Services." Paper in process.

Hershey, N. and M.J. Bowes, "Liability Considerations in Emergency Medical Services: Adopting a Risk Management Approach." Health Services Research and Evaluation Unit, Health Services Administration, Graduate School of Public Health, University of Pittsburgh (National Center for Health Services Research, Department of Health, Education, and Welfare, May 1979).

Hershey, N. and M.J. Bowes, "Liability Exposure of Emergency Medical Services Organization and Personnel - What Risk Management Can Offer." Paper in process.

Medsger, A., "A Comparative Evaluation of High and Low Achievement EMS Programs." Proposed Master's thesis, Graduate School of Public Health, University of Pittsburgh.



Morris, D., "Emergency Medical Services: A Study of Factors Related to Progress in Its Development and Implementation." Abstract of Comprehensive Paper, Graduate School of Public Health, University of Pittsburgh (October, 1977).

Morris, D., "The Effects of the Separation of Emergency Medical Services and Health Systems Agencies' Planning Activities for the Development of Emergency Medical Services." Proposed dissertation for D.P.H., Graduate School of Public Health, University of Pittsburgh.

Rawson, I., E. Ricci, G. Esposito and R. Dorinson, "Quasi-Groups in Health Planning: EMS Councils in Rural Wisconsin." Presented at the 1978 Annual Meeting of the Society for Applied Anthropology, Merida, Yucatan, Mexico (April 2-9, 1978).

Ricci, E., G. Esposito, I. Rawson and W. Corlett, "Regional Planning for Emergency Medical Care: The Status of Evaluation." Presented at the 1978 Meetings of the Midwest Political Science Association, Chicago, Illinois (April 1978).

Ricci, E., M. Gunter and M. Silverman, "The Concept of Developmental Stages in the Analysis of Community Medical Services Planning." Paper in process.

Ricci, E., L. Shuman, I. Rawson and D. Houck, "Technical and Behavioral Approaches to Planning for EMS." Presented at the Ninth Annual Conference of the Society for Advanced Medical Systems, Los Angeles, California (November 9-12, 1977).

Shuman, L., "Models as Evaluative Tools." Presented at the National Evaluation Symposium, New Orleans, Louisiana (January 1977).

Shuman, L., H. Wolfe and J. Sepulveda, "Estimating Demand for Emergency Transportation." Medical Care 15, No. 9 (September 1977).

Shuman, L., H. Wolfe and J. Sepulveda, "Strategic Planning for Change in Emergency Transportation." Presented at the 104th Annual Meeting of the American Public Health Association, Miami Beach, Florida (October 1976).

Silverman, M., M. Gunter, L. Shuman and A. Medsger, "Rural Emergency Health Care Systems: Problems of Regionalization." Presented at the 1978 Annual Meeting of the Society for Applied Anthropology, Merida, Yucatan, Mexico (April 2-8, 1978).

TITLE: A Guide to Investment Criteria  
for Critical Care Units

GRANT NUMBER:  
1 R03 HS 03569

GRANTEE INSTITUTION: Columbia University

PROJECT PERIOD:  
09/30/78-11/30/79

PRINCIPAL INVESTIGATOR:

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AUTHORITY: 305

FUNDING LEVEL:  
FY 78 \$ 47,280

#### OBJECTIVE:

To review and synthesize all existing research and analyses related to investment criteria for critical care units for the purpose of developing a guidebook that will be useful to state and local health planning agencies.

#### SCOPE:

The literature review and analyses include publications on planning and evaluation of critical care units; studies which evaluate efficacy, cost effectiveness and cost benefits of critical care units; methodological summaries of techniques from other fields with potential applicability to health planning; and studies conducted by state and local governments.

#### FINDINGS:

This guidebook identifies the major questions that state and local health planning agencies must address when making decisions regarding the costs and benefits of critical care units. The research sought to clarify many of the issues relevant to planning critical care units (i.e., burn, coronary/cardiac, neonatal, and trauma units, as well as general medical/surgical intensive care units) at both the institutional and regional level. Included are taxonomies of "investment criteria", which are based upon how well a system attains pre stated goals. These criteria can permit decisions, at either the institutional or the regional level, as to whether or not to invest in a critical care unit. At the institutional level, investment criteria such as costs, effectiveness, and cost-effectiveness are discussed. At the regional level, the discussion focuses on demand, needs, availability, accessibility, utilization, cost/benefit analysis, and the estimation of resource requirements through a variety of bed need formulas and mathematical models. The use of these criteria in planning of critical care units is reviewed, summarizing the reasons for and against using them, such as structural validity, measurability, and reliability. The report includes observations and conclusions which may have relevance to Federal and State health planning policy decisions.

TITLE: Locational Analysis of  
Multilevel EMS Systems

GRANT NUMBER:  
1 RO3 HS 03722

GRANTEE INSTITUTION: University of  
Texas at Austin

PROJECT PERIOD:  
08/01/79-07/31/80

PRINCIPAL INVESTIGATOR:  
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AUTHORITY: 305

FUNDING LEVEL:  
FY 79 \$ 26,682

#### OBJECTIVE:

To develop techniques for locating a number of types of emergency medical services units characterized by different levels of Basic and Advanced Life Support capabilities.

#### SCOPE:

Techniques used in operations research will be employed. Using information on the demand for service at specific geographical points, and given the number of units and a maximum response time standard for each level of service, the deployment model will specify locations for each unit which maximize the number of people to be served within the specific time standards. In addition, the model developed in this research will facilitate back-up capabilities between service levels.

#### FINDINGS:

Although models for ambulance unit location are available, none has been developed for multilevel EMS systems in which a small number of Advanced Life Support (ALS) units is augmented by a larger number of Basic Life Support (BLS) units. Coordination is important in such situations, since BLS units can be responsible for: a) responding to non-critical calls, and b) providing back-up assistance on critical calls when ALS units are less immediately available. Unlike previous hierarchical location models which link service levels of a system in terms of technological decisions, this work develops a behavioral framework for efficiently linking BLS and ALS services. Optimal location of these various units can maximize the effectiveness of a given level of resources in the growing number of communities which offer such coordinated tiered systems.

PUBLICATIONS:

Charnes, A. and J. Storbeck, "A Goal Programming Model for Siting Multilevel EMS Systems." Socio-Economic Planning Sciences (forthcoming).

Ruefli, T. and J. Storbeck, "Behavioral Linkages in Hierarchical Locational Systems." Working paper, Institute for Constructive Capitalism, submitted to Management Science (May 1980).

TITLE: Computer-Based Ambulatory  
Quality Assurance Program

GRANT NUMBER:  
3 R18 HS 02142

GRANTEE INSTITUTION: Harvard Community  
Health Plan

PROJECT PERIOD:  
05/01/76-10/31/79

PRINCIPAL INVESTIGATOR:  
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AUTHORITY: 305

FUNDING LEVEL:  
FY 76 \$140,094  
FY 77 \$205,632  
FY 78 \$230,861  
FY 79 \$ 59,978

#### OBJECTIVE:

To develop a quality assurance program based on a computerized ambulatory medical record.

#### SCOPE:

The investigators are constructing and testing process and outcome measures to assess the quality of care via computer-based records regarding eight tracer disease conditions, including both emergency and non-urgent health problems. These assessment methods are being tested through actual use in a large ambulatory clinic practice, and their ability to improve care in various outpatient settings, including Emergency Rooms, will be considered.

#### FINDINGS:

Quality assurance using process and outcome criteria will meet formal requirements of the Health Maintenance Organizations Act of 1973. The study will demonstrate the utility of the COSTAR (Computerized Stored Ambulatory Record) system in monitoring compliance with requirements for quality of care established for outpatient clinics and will assess the impact on provider and system performance of concurrent information feedback to providers.



TITLE: Efficient Resource Allocation  
in Special Care Networks

GRANT NUMBER:  
1 RO3 HS 03157

GRANTEE INSTITUTION: Stanford University

PROJECT PERIOD:  
08/01/78-07/31/80

PRINCIPAL INVESTIGATOR:

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AUTHORITY: 305

FUNDING LEVEL:  
FY 78 \$ 31,583

#### OBJECTIVE:

To develop a day-to-day resource allocation system or regional referral networks of special care centers and referring hospitals. The successful procedures will be incorporated in a computer-based system to assist in resource allocation decisions, and the computerized interactive system will be compared with currently-used manual systems.

#### SCOPE:

This study is developing, demonstrating, and evaluating a resource allocation system. The objective is not to focus on a single measure of performance (e.g., response time) but rather to achieve solutions balancing many measures of an efficient resource allocation center, comparing the costs and benefits of a computerized system and manual systems. The system will be tested in a simulated environment (simulation model), and will be evaluated in the Northern California Infant Medical Dispatch Center using parallel automated and manual dispatching of a set of sample episodes.

#### FINDINGS:

The computer-based system will improve decisions concerning resources needed for patient care at special care centers and will thereby produce measurable costs and benefits. The availability of this system will facilitate efficient regional use of health services especially with regard to the needs of patients in rural areas for expensive special care resources.



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